A1: Continuous oxidation of arsenite by arsenite-oxidizing bacteria enriched from activated sludge

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The health impairment caused by ingestion of arsenic contained in groundwater is serious in areas, such as Bangladesh and India. In order to improve the efficiency of coagulation or adsorption process for arsenic removal, arsenite (As (III)) needs to be oxidized to arsenate (As (V)) by chemical oxidizer as a pretreatment. For the purpose of developing an economical arsenite oxidation method, this research examined continuous oxidation of As (III) to As (V) using a bioreactor where arsenite-oxidizing bacteria enriched from activated sludge were fixed in the Down-Flow Hanging Sponge (DHS). The inorganic media with the As (III) concentrations of 0.5 mg/L and 1.0 mg/L were supplied to two sets of the reactor, respectively. The As (III) and As (V) concentrations were analyzed with an HPLC-ICP-MS. At HRTs of 3 - 0.5 h, more than 95% of As (III) was oxidized to As (V). Moreover, at an HRT of 0.5 h, the bacterial density showed the maximum at the top of 25 sponges and gradually decreased downward. Furthermore, a model of biological As (III) oxidation in the sponge was developed and it could describe the variation of As (III) concentration in the reactor by using the data of cell concentration in the sponge and rate constant obtained in batch experiment.

A2: Study on the arsenic absorption and removal from the soil by arsenic hyper-accumulator and arsenite oxidation by soil bacteria

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Arsenic hyper-accumulators such as *Pteris vittata* have been known applicable to purify arsenic pollution from the soil. The present study focuses on the phytoextraction of arsenic and aims to clarify the participation of microbes in the arsenic absorption by Pteris vittata. The cultivation experiments of *Pteris vittata* have been performed to investigate the transition of arsenic from the soil to *Pteris vittata*. The results show that the arsenite in the soil is promptly oxidized to arsenate and subsequently absorbed by *Pteris vittata*. The arsenic oxidation experiment in the soil with soil bacteria addition has been peformed, and the speciation of arsenic in the soil has been investigated. The results suggest that soil bacteria are responsible for the arsinite oxidation. T-RFLP analysis targeting to arsenite oxidase genes, *aroA*s, has been applied to analyze the microbial community in the rhizoshpere of *Pteris vittata*. The results suggest that specific *aroA* containing bacterial strains are involved in the arsenite oxidation prior to being absorbed by *Pteris vittata*.

A3: Influence of Pond Seepage on Groundwater Pollution by Arsenic in Hanoi, Viet Nam

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Ponds are abundantly found in suburban area of Hanoi City, Viet Nam, where groundwater pollution by arsenic is a major problem. We investigated water quality of pond waters, pore waters of pond sediments, and chemical property of pond sediments in four ponds in Hanoi suburbs in order to estimate the influence of pond seepage on groundwater pollution by arsenic. While pond waters had low arsenic levels (<10 μg/L), pore waters had high levels of arsenic (maximum: 134 μg/L), indicating the dissolution of arsenic from arsenic- and organic matter-rich pond sediments. It was also suggested that pond sediments not only released arsenic but also adsorbed arsenic from the dissolved phase, mitigating groundwater pollution by arsenic. Analysis of chloride and stable isotopes (δ18O, δD) indicated that seepage from ponds was a significant source of recharge of groundwater which was polluted by high levels of arsenic (median: 27 and 43 μg/L).

A4: Inhibiting effect of chlorination and coagulation on membrane fouling during ceramic membrane filtration for water containing algae

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To investigate the inhibiting effect of chlorination and coagulation on membrane fouling during ceramic membrane filtration treatment for water containing higher concentration of algae, pilot scale membrane filtration experiments were conducted under different chlorine and coagulant dosages. The observed transmembrane pressure profiles demonstrated clear that chlorination and coagulation applied prior to ceramic membrane filtration could effectively alleviate the extent of membrane fouling, thus enhancing the filtration performance. In regard of water qualities after treatment, the concentration of dissolved organic matter, assessed by either UV260 or TOC, decreased as the dosages for coagulant and chlorine increased; however, the decreasing extent for UV260 was found to be slightly higher than TOC. The mechanisms behind the observed inhibiting effect on membrane fouling were probably related to the capability of coagulation in lowing the concentration of dissolved organic matter, the capability of chlorination in altering the features of fouling-causing substances, and the effect on membrane cleaning by residual chlorine during chlorination treatment, which need further investigations along with investigations for controlling disinfection byproducts associated with chlorination.

A5: Effects of extracellular polymeric substances (EPS) and iron ion on colony formation of unicellular Microcystis aeruginosa

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In this study, the collection of extracellular polymeric substances (EPS) as a powder form from unicellular *Microcystis aeruginosa* and water bloom was attempted to control the EPS concentration in the culture medium and to promote the colony formation of unicellular *M. aeruginosa*. Then, the effects of EPS and divalent cation such as iron ion on the colony formation of *M. aeruginosa* were examined through the unialgal culture experiment. The results showed that EPS collected from unicellular *M. aeruginosa* possessed the hydroxyl groups and carboxyl groups on EPS, indicating the similar trend to other cyanobacterial species. The unialgal culture experiment showed that, at the iron ion concentration of 0.68 mg-Fe/L, EPS itself would not act as a binder for *M. aeruginosa* cells. However, the colony of *M. aeruginosa* was observed when EPS as well as high amount of iron ion (6.8 mg-Fe/L) were added into culture medium, and the colony density tended to be higher for culture medium with the EPS concentrations of 10 mg/L or less than that with the higher condition (EPS = 25 mg/L).

A6: The evaluation of *Sinanodonta woodiana* application feasibility as a microcystis-blooming removal tool in microcosm experiments

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Sinanodonta woodiana is widely distributed throughout Chinese freshwaters and is an important economic pearl mollusk. In order to evaluate the application feasibility of *S. woodiana* as a *Microcystis*-blooming removal tool, a series of microcosm experiments were performed. First, the 6-day feeding responses experiment was carried out with naturally blooming pond water and the bivalves in laboratory, which was lasted for 6 days. In this experiment, phytoplankton abundances and community structure were analyzed on 0-day and 6-day for both control and treatment microcosms; also, filtration rate, absorption efficiency, oxygen consumption rate and ammonia excretion rate of *S. woodiana* were measured on 0-day and 6-day and finally the scope for growth (SFG) value as a measure of metabolic energy balance for *S. woodiana* was calculated and compared. The results showed that *Microcystis* spp. of colony and unicell were reduced obviously on the 6-day; meanwhile, after six days' exposure to *Microcystis*-blooming pond water, the SFG value for *S. woodiana* increased. Furthermore, in the extended long-term grazing experiment, bivalves were fed with highly concentrated toxic *Microcystis*-blooming water and non-toxic *Chlorella* at the constant concentration (Chl.a=424.5 mg/m^3) in two respective tanks for 12 days. No bivalve mortality was registered on both *Chlorella* group and blooming water group. In addition, SFGs were significantly higher for the blooming water group, compared with them for *Chlorella* group on 3-day, 6-day and 12-day. These results indicated that toxic *Microcystis* spp. in natural eutrophic water can be removed greatly by *S. woodiana*; moreover, the bivalves themselves have strong adaptation ability when they were exposed to toxic natural eutrophic water. Therefore, it can be inferred that there is high application feasibility of *S. woodiana* as a *Microcystis*-blooming controller in practice.

A7: Development and Application of Liquid-Film-Forming Apparatus in Cultivation Pond

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In this study, using a Liquid-Film-Forming Apparatus (LFFA) was applied as a Novel Oxygen Supply device in the cultivation pond, in order to compare energy consumption with the mechanical surface aerators. The result showed that the energy consumption of LFFA decreased 1.6 times in comparison to the mechanical surface aerators. Moreover, the effect of the LFFA performance on the habitat of tilapia was also investigated. The gently flow rate was obtained by this equipment, so there is preferential survival rate for tilapia fry. However DO was decreased, resulted that the growth rate of tilapia was slower than in the conventional method. It is considered that hot air was supplied in the pond due to air pump was operated continuously. While the temperature was risen, decrease of oxygen solubility was taken into account in this study.

A8: Feasibility study on introduction of Hybrid System for Water Supply from the viewpoints of water utilities' finance and residents' expense in developing countries

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In this research, it is proposed that until safe piped water supply systems like those in developed countries are established in developing countries, a two way system of piped and bottled water, the so called Hybrid System, should be introduced. Both should be provided by the same public water utilities. The objective of this research is to clarify the feasibility of the proposed the hybrid system from the viewpoints of water utilities' finance and residents' expense. Results of field surveys in three developing countries showed that the real situation of residents' water usage. And results of simulations under the conditions of surveyed areas showed that users can get more bottled water than ever at a cheaper price. At the same time, the water utilities can get a lot of profits from the sale of bottled water and can use the profits for rehabilitation or renewal of their facilities. Therefore, results of this study showed that safe drinking water and water for other uses could be guaranteed as Basic Human Needs for all residents with an appropriate charge by introducing the hybrid system. Thus, the proposed hybrid system results in a WIN-WIN situation for residents and water utilities in developing countries.

A9: Household coping measures with water scarcity: A case study in Kathmandu, Nepal

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Water scarcity is a fundamental challenge in many countries. Governmental efforts to address it are often insufficient, making it necessary that adequate household-level coping measures are taken. Using the Kathmandu Valley as a case study, we investigated household coping measures and factors influencing the selection of these measures. Further, we quantitatively estimated the potential amount for gray water use and rainwater harvesting as coping measures in the Kathmandu Valley. Interviews were conducted with 217 households on their water sources/uses and socioeconomic characteristics; 32 households were selected for a survey on the details of water consumption for different purposes using the diary method. Households with shorter periods of piped water supply tended to have a larger number of water supply sources to cope with water shortages. Household income was found to be a major factor influencing the selection of coping measures. The average water consumption was 36.9 ± 11.1 L/cap/day. To cope with water scarcity, the low-income group reduced their water consumption for bathing and laundry while maintaining their consumption for more essential activities such as hygiene and cooking. The study suggested that a 10,000-L water-storage tank for rainwater harvesting would be sufficient to meet the minimum requirement (50 L/cap/day) over a year if gray water use could be practiced in addition to piped water supply.

A10: Grey Water Treatment by Slanted Soil System Considering Practical Condition in Sahel Africa

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This study aims to evaluate the performance of Slanted Soil System (1) under water use condition in rural family in Sahel Africa, and (2) using soil which containing compalatively wider range of particle size than former studies. Experimental condition was designed on the basis of field survey conducted in Burkina Faso. Soil contains wider range showed no clogging in 8 weeks experimental period, and LAS, COD, SS removal were same level as fine soil, which showed good removal efficiency but easy to clogg. There observed two pathways of water flow in chamber: soil surface run-off, and soil infilteration flow. These pathways may have buffering function to diffuse clogging effect and enlong the period until complete clogging without breakthrough.

A11: Effect of temperature, pH and vegetation on the removal of zinc from mine water in aerobic wetland mesocosm

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This study investgeted the effect of temperature, pH and vegetation on removal efficiency of zinc from mine water in aerobic constracted wetland mesocosm. During two month operation,the removal efficiency of zinc was sharply decreased from 92% to 52% in unvegetated wetland mesocosm and from 95% to 39% in vegetated, respectively. However, by maintaining neutral pH condition using limestone, pH in the unvegetated wetland gradually increased which followed by high zinc removal, revealing a good correlation of zinc removal with pH. It was obvious that zinc removal in vegetated wetland was lower than that in unvegetated. Despite presence of limestone, the removal of zinc decreased when temperature decreased. Adsorption experiments in batch and continuous system proved the effect of temparure and pH on zinc removal observed in aerobic wetland mesocosm. The result of speciation of zinc by sequential extraction suggested that zinc removed in aerobic wetland mesocosm was mainly consisted of exchangeable form. It was considered that because oxygen supplied from roots caused pH decline, the fraction of exchangeable form in vegetated wetland as well as amont of zinc removed was lowed compared with unvegetated wetland.

A12: AN *IN-SITU* DENITRIFICATION AND OXIDATION PROCESS WITH INJECTION OF ELECTROLYTIC HYDROGEN AND OXYGEN

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Continuous treatments of synthetic groundwater were conducted by using an *in-situ* denitrification and oxidation process, and measurements of water quality parameters such as nitrate, nitrite, DO, etc. were made over one year. In the *in-situ* process, hydrogen gas and oxygen gas were produced by using an electrolytic cell and were injected separately into a laboratory scale aquifer filled with glass beads. Experimental results demonstrated that stable denitrification and oxygenation of groundwater were achieved. During the initial phase of experiment, nitrite was accumulated in a hydrogen-injected zone; however, it was oxidized to nitrate in subsequent oxygen-injected zone. In addition, water quality parameters such as TOC, SS, turbidity and chromaticity were smaller in the effluent than influent, and no clogging problem was observed. From these results, we concluded that the present process has several superior performances in terms of stability, effluent water quality and simplicity in long-term operation.

A13: EFFECT OF THE VEGETATION AND SUBSURFACE WATER LEVEL ON NITROGEN REMOVAL IN A FIVE-STAGE VERTICAL FLOW CONSTRUCTED WETLAND

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In this study, the effect of the vegetation and subsurface water level on nitrogen removal was elucidated based on two years performance obtained in a real scale vertical flow constructed wetland consisting of five-stage treatment. Neither presence of the vegetation and half-saturated condition had significant positive effect on nitrogen removal in the first year operation. It needs one year operation to stabilize ammonification and nitrification process and presence of the vegetation offered a significant improvement of TN removal in the second year. Stimulation of nitrogen removal was significant at downstream treatment stage among five-stage, resulting in a high overall nitrogen removal in the second year operation. This tendency was obvious especially in the vegetated condition regardless of the subsurface water level, suggesting no significant effect of half-saturated condition. Based on the variation of annual nitrogen removal through five-stage treatment, potential mechanisms of effect of the vegetation and subsurface water level on nitrogen removal were discussed.

A14: Application of Alum Sludge and Aquatic Plant for Advanced Treatment of Municipal Wastewater and Nutrient Recovery

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This study investigated advanced treatment of municipal wastewater effluent and nutrient recovery through the application of alum sludge and/or aquatic plant. Three lab-scale filtration columns were prepared; Column 1 and 3 contained alum sludge, and Column 2 gravels as the filtration media. Also, watercress was planted in Column 2 and 3. At the filtration velocity of 0.13 and 0.25 m/d, the three columns performed well with respect to SS removal (the removal efficiency of 88-93%). For Column 1 and 3, T-P was removed almost completely to the level 0.02-0.03 mg/L with the removal efficiency of 97-98%. Alum sludge was estimated to have a maximum adsorption capacity of 0.87 mgPO_4^{-3}-P/gDW. The T-N removal efficiency was 55-62% in Run 1 and 20-35% in Run 2, showing impairment of denitrification with the increase of filtration velocity. T-Al concentration in the effluent was similar, approximately 0.04 mg/L, among the three columns, indicating that the dissolution of aluminium from the alum sludge was negligible. 14-19% of N, 8-9% of P and 41-50% of K in the influent were recovered as the harvested aquatic plant, serving to recycle the valuable nutrients.

A15: Nutrient Removal and Phosphorus Recovery from Municipal Sewage Using Anaerobic/Anoxic Sequencing Batch Reactor

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In this study, nitrogen and phosphorus were removed by using denitrifying phosphate-accumulating organisms (DPAOs). An anaerobic / anoxic sequencing batch reactor (A2SBR) was operated to culture the DPAOs. A2SBR system achieved 77% of nitrogen and 83% of phosphorus removal efficiency in a system feeding actual sewage. The result showed that this system is suitable for the nutrient removal of sewage treatment. The A2SBR sample was then subjected to microbial community analysis using FISH method and the result showed that a stable treatment process was performed at 15% or more of PAOs ratio. Additionally, a hydroxyapatite precipitation (HAP) reactor was applied as the downstream system. As a result 29% of phosphorus was recovered from the sewage by the calcium-added physicochemical technology. This HAP reactor became applicable with concentration of the phosphorus around ten-fold, although influent phosphorus was as low as about 4 mg-P/L.

A16: Research on Phosphorus Recovery by using Nano-size Layered Double Hydroxide (NLDH)

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The authors developed the HT/Ze phosphorus recovery system which uses Hydrotalcite (HT) like compound and Zeolite (Ze) in previous research. It was found out that Nano-size Layered Double Hydroxide (NLDH) can be used instead of ordinal HT. Fundamental functions of NLDH related phosphate adsorption, desorption, regeneration of adsorption ability and phosphate adsorption from actual wastewater, were experimentally investigated. Saturation quantities of phosphate adsorption by powdered- and granular- NLDH were measured, and it was found that the difference in adsorption quantity is small. In desorption tests, it was confirmed that 90% of adsorbed phosphate in NLDH can be desorbed into desorbing solution. $MgCl_2$ solution which is high cost is usually used for regeneration of adsorption ability of typical HT. A new regeneration method by using HCl-NaCl solution for reducing regeneration cost was tried and more effective regeneration than MgCl2 is attained under the conditions of pH=3 and NaCl=5.0mol/L. Practical examination by using treated sewerage at wastewater treatment plants was demonstrated to examine the performance of phosphate adsorption ability of NLDH. Anion, such as sulfate and carbonate, inhibit the adsorption of phosphate. Although the effect of carbonate was thought to be high, it was confirmed that NLDH can adsorb phosphate from actual wastewater.

A17: High Efficient Phosphate Removal and HAP Recovery by a Multi-Electrode System

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Continuous experiments for phosphate removal and recovery from a synthetic wastewater containing calcium phosphate were carried out using an electrolytic reactor equipped with a multi-electrode system. Experimental results demonstrated that phosphate was removed by deposition of aggregates in reactor. In addition, it was found that removal rates and recovery rates of phosphate increased and, after reaching their maximum values, decreased with an increment of applied electric current. Deposit in reactor was recovered and was identified as hydroxyapatite (HAP) from XRD analysis. Furthermore, from comparisons of observed and calculated ions fluxes, it was shown that removal rates of phosphate had a maximum value at a certain electric current density and were controlled by either electrolytic production of hydroxyl ion or mass transfer of hydrogen phosphate ion depending on applied electric current density. Moreover, it was considered that the removal and recovery performance could be enhanced by using working electrodes having larger specific surface area.

A18: Resource Recovery from Waste Mushroom Bed by using NaOH Treatment

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Studies of energy recovery from cellulosic biomass has been widely conducted. However, to establish the utilization technologies of cellulosic biomass, there are several technical problems to overcome such as processing cost, establishment of effective pretreatment, and disposal of residue. Therefore, our research group have developed the multistage treatment process for effective utilization of cellulosic biomass to reduce the treatment cost. The process recovered a valuable resources and sugars by pretreatment and enzymatic saccharification, and methane recovered from residue of enzymatic saccharification by methane fermentation finally. In this study, effect of NaOH pretreatment for the multistage treatment process was investigated by using waste mushroom bed as a cellulosic biomass. As the result, lignin (30%, w/w), silica (38%, w/w), and sugar (25%, w/w) were eluted and recovered in 2.0%-NaOH pretreatment process. The amount of sugar and methane recovery in enzymatic saccharification and methane fermentation increased using NaOH pretreatment. Consequently, 51% (w/w) of resource was recovered from waste mushroom bed by multistage treatment process with 2.0%-NaOH pretreatment.

A19: Studies on Component Characteristic of Fruiting bodies of Oyster Mushroom Cultured on Barley Shochu Lees and Utilization of the Waste Culture Media

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In this study, we have used barley shochu lees as culture media for elevating the product value of oyster mushroom fruiting bodies in a similar manner with sweet potato shochu lees. The results showed that the barley shochu media were found to be better culture media than sweet potato shochu lees media and control media for oyster mushroom. Fruiting bodies cultured on barley shochu lees showed the higher values in protein and free amino acid amounts. The media of barley shochu lees were reusable as mushroom culture media, and the reuse lower the contents of ADF, NDF, and lignin of the waste media. Taken together, it is apparent that the reuse of culture media reduces the cost of the mushroom production and promotes the utilization of the media as feedstuff.

A20: Sorption characteristics of cesium onto reservoir sediment

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The aim of this study was to evaluate the sorption characteristics of cesium onto freshwater reservoir sediment. For this, batch sorption experiments using sediment collected from a fresh water reservoir were conducted for 27 combinations of water temperature (5, 20 and 35 ºC), pH (5, 7 and 9) and EC (130, 160 and 190 µS/cm). In addition, the distribution of adsorbed Cs was examined using scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDS) and X-ray diffraction (XRD). The results showed that the equilibrium sorption data of cesium onto reservoir sediment could be fairly-well described by both Langmuir and Freundlich isotherm models. The estimated isotherm parameters indicated that the impacts of water temperature, pH and EC on the sorption capacity of cesium were less obvious within the investigated ranges of these three variables. EDS mapping and elemental analysis of sediment after cesium sorption, together with the analysis by XRD, revealed that sorption of cesium on the reservoir sediment occurs mainly on its surface and the distribution of the adsorbed Cs on sediment was not uniform.

A21: Analysis of Future ^{137}Cs Forest Soil Contamination Using Dynamic Model for Evaluating ^{137}Cs Distribution in Forest After the Fukushima Nuclear Accident

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^{137}Cs released from the Fukushima Daiichi Nuclear Power Plant accident in March 2011 has diffused over wide forest areas and will produce a long-term contamination in the forest ecosystem in Fukushima region. In this study, we developed a model for evaluating vertical distributions in coniferous and deciduous forest soil based on the reported model for estimating ^{137}Cs in forest areas after the Chernobyl accident. The model was examined with the monitoring data. The future effect of the forest remediation at this point in time was predicted using the model that the remediation of organic layer and 0-2cm surface soil in coniferous forest would have more effect and the recontamination after remediation would reduce the effect in deciduous forest.

A22: Estimation on the origin and behavior of radioactive Cs in Natsui river basin

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In this study, we conducted a survey of radioactive Cs contained in soil, sediment, vegetation, and lakes and river water in the Natsui river basin, which was extensively contaminated by radioactive fallout from the nuclear accident. This study focuses on the runoff behavior, pollution level/scale and accumulation in soils/sediments of radioactive 134Cs and 137Cs. Half-life ratios of 134Cs and 137Cs were used to quantitatively evaluate the impact from the nuclear accident source. In addition, a model was created to reproduce and forecast the concentration of Cs and to predict long-term changes in water contamination levels in the Kodama-dam lake and its river inflow. In this study, a relatively high Cs concentration was detected in the lake and pond sediments with the Fukushima nuclear power plant estimated to be the source of more than 90% of the Cs contamination. From the results it was estimated that the Cs concentration in the Lake of Kodama dam was initially a few Bq/L, with an expected reduction to about 0.1 Bq/L in 10 years.

A23: Survey and Decontamination Trial of Boat Wastes Contaminated with Radioactive Cesium

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Field survey was conducted to investigate radioactive cesium contamination status of the fiber reinforced plastic (FRP) boats which were damaged by the Great East Japan Earthquake and resulting tsunami, and further affected by nuclear fallout from the accident at the Fukushima No. 1 nuclear power plant. Radiation dose rate was measured targeted at some selected boats and the surrounding environment by using radiation survey meters (i.e., NaI (Tl) scintillation counter and GM counter) and a radiation-sensing camera in order to visualize a dose rate distribution within the area. In addition, FRP parts, sediment deposits and stagnant waters in the boats were sampled and their 134Cs and 137Cs radioactivity were measured by gamma-ray spectrometry using NaI (Tl) scintillation or Ge detector. From the monitoring results, materials or sediments in the boats enhanced the radiation levels, however, which can be significantly reduced by decontamination operations such as removal and wash-out of the materials or sediments (i.e., countermeasures for surface-deposited radioactivity). Consequently, the conducted survey and decontamination approaches became a good model and promoted a prompt dismantlement, removal and further disposal/recycle by the local authorities concerned.

A24: Long-term averaged concentration estimation of instantaneously discharged air pollutants using the meteorological scenario days

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The meteorological scenario days are representative samples of a variety of daily meteorological conditions which occur during risk estimation period. In the present study, we proposed a simple method using meteorological data of the meteorological scenario days and the Trajectory-puff model, to get long-term averaged concentrations of air pollutants which are discharged instantaneously. Assuming that air pollutants were discharged instantaneously at a point of the Fukusima first nuclear power plant, seasonal long-term averaged concentrations are calculated. Applicability of the method was examined by comparing this seasonal mean concentrations by using the meteorological data with those by using meteorological data of whole three months. Inaddition, a usage of the method was investigated by comparing with monitoring date of radioactive materials.

A25: Field observations of nocturnal drainages in the northern Osaka plain by pilot balloon observation

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The Osaka Plain faces with the Hokusetsu and Rokko Mounts on the north. The purpose of the present study is to clarify flow structures of nocturnal drainages which break out on the south-facing slopes of the mounts and flow into the north part of the Osaka plain. Vertical profiles of horizontal wind velocity and turbulence properties on the ground are observed by the pilot balloon observation and a ultra-sonic anemometer. And such meteorological data as AMeDAS data were analyzed to examine horizontal flow extent. Vertical profiles of a north-south component of horizontal wind velocity of the nocturnal drainages are quite similar to those of gravity density currents which flow on inclined planes. The nocturnal dranages caused suddenly temperature drops when heads of the nocturnal drainages arrive at the observation point but doesn't contribute to suppress vertical turbulent temperature transport.

A26: Microbial Community Composition in the DHS Reactor Treating Toluene Gas

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Microbial community structure of the DHS reactor was investigated by 16S rRNA and functional gene targeted clone-sequence analysis. A known toluene degrading microorganisms of Pseudomonas species were existed in each sampling point. Especially, at the bottom of the DHS reactor, toluene-degrading microorganisms were dominantly detected. Quantitative real-time PCR targeting the functional genes of toluene degradation in a sponge of bottom of DHS reactor revealed that copy genes by tmoA targeted primer set, which encoding the part of toluene-4-monooxygenase, was mostly existed in outside of the sponge. Copy genes by tbmD targeted primer set, which encoding the part of toluene/benzene-2-monooxygenase, was existed in the every part of the sponge. Copy genes by todC targeted primer set, which encoding the part of xylene dioxygenase, was not only existed in outside of the sponge, but also existed in inside of the sponge. Based on these results, toluene degradation was occurred in both of outside and inside of the sponge.

A27: Enhancement of the transcriptional activity of the PCB degradation genes in Rhodococcus jostii RHA1 by the introducing of catechol degradation gene

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In a polychlorinated biphenyl degrader Rhodococcus jostii RHA1, the transcription of bph genes, which are responsible for the degradation of biphenyl (BP)., is activated in the presence of biphenyl In the previous studies, it has been revealed that the transcriptional activation of bph genes by BP is repressed in the presence of benzoate (BA), which is one of the metabolites of BP degradation by RHA1, and that the substrate that caused the repression is catechol, a lower metabolite of benzoate. In this study, we introduced the catA gene encoding catechol 1,2-dioxygenase into RHA1 using a plasmid vector, and observed the promoter activity of the bphAa gene, which is one of the bph genes, in the presence of BP and BA. We also observed the growth of RHA1 expressing the catA gene in the minimum medium using BP as a sole carbon source. It was shown that the repression of the transcriptional activation by BP in the presence of BA was released by the expression of the catA gene. Moreover, the growth of RHA1 expressing the catA gene on BP was much faster than that of RHA1 with the vector control. From these results, it was shown that the overexpression of the catA gene released the repression of the transcriptional activation of bphAa by catechol, and improved the growth of RHA1 on BP.

A28: Monitoring of ribosomal RNA in the supernatant of activated sludge

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The authors developed a protocol to analyze 16S rRNA in supernatant of activated sludge by reverse transcription–polymerase chain reaction (RT-PCR), and monitored a cycle of a laboratory activated sludge sequencing batch reactor (SBR) with the developed method. When RT-PCR was performed with filtered activated sludge supernatant with 25 thermal cycles, products were obtained, and were confirmed to originate from RNA, not DNA. The supernatant of the SBR was analyzed by the developed method in combination with pyrosequencing. Some of the operational taxonomic units (OTUs) were observed to increase or decrease significantly, while others remained stable. It was thought that the fluctuation of the OTUs were specific phenomena. While the real meanings of the fluctuations of rRNA in the supernatant are not yet fully understood, the authors developed here a new approach to investigate microbial ecosystems in activated sludge.

A29: Effects of nickel ion on microbial community structures under high salt concentration environment and isolation of novel nickel resistant microorganisms

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Effects of nickel ion on microbial community structures under high salt concentration environment were investigated. Nickel resistant microbial cultures were enriched in a chemostat reactor by feeding landfill leachate in which nickel (II) chloride was added. Stable enrichment was established up to 2 mM of nickel (II) chloride addition. Microbial community structures of enrichment cultures were analyzed by pyrosequencing. Drastic community change, even at class level, was observed when nickel (II) chloride concentration was increased. In the culture enriched with 2 mM of nickel ion, Nitratireductor were the dominant genus, indicating that they are likely to have nickel resistance under the high salt concentration environment. Novel nickel resistant microorganisms, including the member of Nitratireductor, were isolated from the reactor.

A30: Effect of oxygen reduction reaction activity of cathode on power production of and microbial community in microbial fuel cell

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Four air-cathodes with different oxygen reduction reaction (ORR) activity were made using different catalysts and microbial fuel cells (MFCs) were operated with them. For the enrichment process of electrogenic bacteria, MFCs with high ORR activity showed earlier growth. However, after electrogenic bacteria grown well, all MFCs showed almost the same power density, 4.5A/m2. Additionally, in the MFC with the cathode of the lowest ORR activity, microbial community of anode was different from other MFCs. Moreover, the polarization curve of the anode was also different from the other anodes. These results indicate the difference in ORR activity of cathode in this study affected on the growth speed and microbial community of anode microbe, but did not affect on the power production after anode bacteria grown.

A31: Season variation of wastewater treatment characterictic and eukaryotic community structure of down-flow hanging sponge (DHS) reactor applied for post-treatment of UASB reactor treating municipal sewage

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In this study, we determined the wastewater treatment characteristic and eukaryotic community structure in the retained sludge of a down-flow hanging sponge (DHS) applied for post-treatment of upflow anaerobic sludge blanket (UASB) reactor treating municipal sewage under different seasons. The change in the eukaryotic community structure was observed during the entire operational conditions. Under the condition of higher concentration of COD and NH4+ , which is an upper part of DHS, Paramecium spp. and Colpidium spp. were predominanted by microscopic observations. On the other hand, under the condition lower concentration of COD and and NH4+ , which is a bottom part of DHS, Arcella spp. and Centropyxis spp. were predominated. Additionally, single cell of predominant eukaryote, which was isolated by micromanipulator from the sludge, was used for 18S rRNA gene sequence analysis. As a result, predominant eukaryotic species could be identified as species level based on 18S rRNA gene sequence. Therefore, simultanious use of morphological observation and sequence identification of eukaryotic spiecies is efficient method for evaluation of eukaryotic communities of sludge.

A32: FUTURE TREND OF SULFATE ION CONCENTRATION IN ACID WATERS AT MT. ADATARA

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In Lake Inawashiro, pH has been affected by inflow of acid thermal water and acid mine drainage at Mt. Adatara, and has been rising rapidly from 5 to 6.8 since 1995. Negative impacts due to pH variation have become a concern. In this study, the future trend of the sulfate ion concentration in acid waters at Mt. Adatara was estimated using non-linear regression analysis to study preventative measures. The d34S value of sulfates and the seasonal variation of the sulfate ion concentration in Iwo river and Ama stream suggested that acid waters was predominantly generated by disproportionation reaction of SO2 gas, and oxidation of hydrogen sulfide accompanied with the formation of sulfur deposits. The presence or absence of ground water in the liquid phase was an important factor for the generation of acid waters. It was also suggested that reduction in the sulfate ion concentration of acid waters was caused by the increase in temperature and the evaporation of ground water inside Mt. Adatara. In order to validate the hypothesis about reduction in sulfate ion concentration and to estimate overall future trend, non-linear regression analysis was employed for Numajiri thermal water, because its trend of sulfate ion concentration was representative of that of acid waters at Mt. Adatara. From these results, we concluded that sulfate ion concentration would increase again in the future if the temperature inside Mt. Adatara decreases.

A33: Determination of Zn^{2+} in industrial wastewater by fluorescence spectroscopy with fluoroionophore

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We applied a novel fluorescent indicator (i.e., fluoroionophore) for industrial wastewater to determine Zn^{2+} by using fluorescence spectroscopy. The fluoroionophore showed red-shifted fluorescence upon Zn^{2+} binding. The indicator exhibited ratiometric fluorescence spectral change with increase of Zn^{2+} concentrations. Zn^{2+} was successfully determined in real industrial wastewater matrix by using the fluoroionophore. In this research, we could demonstrate the potential application of fluorescence spectroscopy with the fluoroionophore to determine heavy metal ions in real wastewater.

A34: Lead sorption from aqueous solution using apatite and residue ash recovered from sewage sludge ash

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This study evaluated the lead sorption ability of apatite and residue ash recovered from sewage sludge ash to use them as a heavy-metal sorption amendment. The level of lead sorption and initial lead sorption rate of the apatite and residue ash were greatly higher than those of the sewage sludge ash, indicating that phosphorus recovery treatment from sewage sludge ash can enhance the capacity of lead sorption. The level of lead sorption enhanced further after dissolution-precipitation treatment of apatite. Lead was sorbed onto residue ash by the precipitation of lead sulfate, which correspond to 66% of total lead sorption. The level of lead sorption of residue ash was increased and the percentage of lead dissolution from residue ash was decreased with pH increase from acid to neutral. The lead sorption abilities of improved apatite and residue ash were equal and/or high compared with other apatites and industrial by-products/wastes, respectively, suggesting that they are probably able to be used as a lead sorption amendment from wastewater.

A35: Effect of Chemical Properties of Humic Substances on Oxidation Rate of Ferrous Iron in Natural Waters

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The oxidation kinetics of ferrous iron (Fe(II)) in the presence of humic substances, which widely occur in natural water, was investigated by determining the oxidation rate constants of Fe(II) by dissolved oxygen (O_2) and hydrogen peroxide (H_2O_2) (k_{O2} and k_{H2O2}, respectively) in a bicarbonate buffer at pH 8. The Fe(II) oxidation experiments indicated that both k_{O2} and k_{H2O2} varied widely depending on the type of the co-existing humic substance, while the oxidation rate constant for O_2 was found to be greater in the presence of humic substance. The oxidation rate constant for H_2O_2 significantly correlated with the contents of carboxyl group and aromatic carbon in humic substance. The finding from our study indicates that the oxidation rate of Fe(II) is likely altered by the complexation of Fe(II) with humic substances with the rate dependent on the types and quantities of Fe-binding sites in humic substance in addition to the charge characteristics of coordinating ligand.

A36: Estimate of Dissolved Silicate load in Paddy field

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There are many paddy fields in the Ariake seaboard. The paddy fields are added fertilizer included Si and paddy rice absorbed dissolved Si (DSi). Therefor, Si loads in inflow and outflow were estimated in two paddy fields (C and D) in order to evaluated DSi loads from the land to Ariake Sea. Si loads in inflow of C and D were 71 and 44 g/m2 and Si loads in outflow of paddy field C and D were 100 and 40 g/m2. The fertilizer included Si accounts for a large percentage in Si load in inflow and the absorption by paddy rice accounts for a large percentage in Si load in outflow. There are much amount of Si absorption by paddy rice in paddy field C than it in paddy field D, because that the soil of paddy field C may include much available Si than it in paddy field D. Si loads in outflow by overflow to Si loads in inflow from a pond are 16 -42 %. Therefore, DSi load in inflow from water bodies may decreases through a paddy field.

A37: Temporal and Spatial Changes of Dissolved Silicon and Diatoms in the North-eastern Ariake Bay

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A survey was conducted on dissolved silicon (DSi) and other nutrient salt concentrations and plankton in the northeastern area of the Ariake Sea to examine the effects of DSi on the coastal ecosystem. The DSi concentration in the area decreased twice a year. A significant decrease in DSi was particularly noted in February and March, and dissolved inorganic phosphorus (DIP) also reduced. The decreases are presumably due to the proliferation of large diatoms, including Eucampia spp.. Significant decreases in nutrient salt ratios were also noted: the DSi/DIN ratio was 1 or lower and the DSi/DIP ratio was 10 or lower. The spatial distribution of the nutrient salt concentration didn’t make the differences of the species of phytoplankton during this period.

A38: A Comparative Study of Water Supply Systems in Depopulating Society Based on Water Quality and the Maintenance Costs

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In the depopulating society, several problems arising out of the decrease in water demands should be considered. First, it will be difficult to continue investing adequate money in distribution systems. Second, increase of retention time of drinking water within the pipelines will lead to rise of the concentration of total trihalomethanes (TTHM) at the final faucet above the standard value. In this study, we suggested several scenarios for the future water supply system and compared them with two indices: total cost of maintenance and renovation, and concentration of TTHM. We set several patterns of population distribution for each scenario and analyzed how each pattern contributed to the outcome. The result showed that the scenario of introducing advanced treatment system did not improve the water quality if most people lived densely in one district. On the other hand, the scenarios of downsizing pipelines and introducing decentralized treatment systems decreased the concentration of TTHM regardless of population distribution.

A39: Assessing Individual Factors Defining Patterns of Tap Water Drinking and Modelling the Choice of Tap Water Use for Drinks

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Residents in Tokyo and Saitama Pref. were segmented by the patterns of tap water drinking and the factors that affect to the varieties of the patterns were explored with the object of users' general/regional environmental consciousness or health consciousness. A model obtained by Bayesian network analyzed the effect to the choice probability for each segment. Unease of qualities of tap water mainly affects on the behaviors, and reduction of the unease enables to arise the ratio of direct tap water drinking from 40% up to 55%. While, environmental consciousness is most affective factor to grow the unease for quality of tap water. Measures to promote rigid understandings and calm judgment to environmental issues would be required for eliminating the unease.

A40: A Model Analysis of Life-Cycle CO_2 Emissions in a Water Pipeline System

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Japan’s water facilities are social infrastructure essential to people’s lives. At the same time, however, the large investment in resources and energy has an impact on the environment. Moreover, these facilities are currently facing a difficult phase in which large-scale renewal is needed due to their advancing age, having been built largely during past times of high economic growth. In order to continue maintaining water pipelines as lifelines, one important issue to be considered is the transition to a system with as little environmental impact as possible. This paper, focusing on water pipeline systems made up of pipeline facilities and pump facilities, calculates the CO_2 emission amounts, from the standpoint of LCA (Life Cycle Assessment), in each of the processes of construction, operation, maintenance, and renewal (of facilities past their service life). Comparing transport by vehicle and by pipeline, the latter (pipeline) is shown to be superior for water transmission. The effects of population density, differences in pipeline layout, and pipe diameter on CO_2 emissions are further clarified from multiple aspects.

A41: Water Main Failure Rate Prediction under Insufficient Break Information

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In order to make renewal planning for aged water main, the estimation for pipe failure rate is required. The formulae for prdecting pipe failure rate have been developed in large waterworks bureaus. However, medium and small waterworks departments generally do not have their own prediction method because the accumulation of pipe break data is necessary to make the formula. In this paper, the method to obtain pipe failure predicting formula with insufficient accumulation of pipe break data using previously presented ones is examined. The Baysian statistics was used to develop the method. The presented method showed valid results to predict pipe failure rate in case studies.

A42: Study on the Risk Assessment by Accident Rate of Water Distribution Pipeline Using GIS

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This paper examines the risk assessment of aging distribution pipelines, focusing on the maintenance and management of water distribution pipeline facilities which are indispensable for supplying water continuously. Water leaks often cause great damage to the activities of cities, and because water pipelines are laid underground, it is crucial to perform preventive maintenance to avoid such accidents. In this study, a regression model of the accident rate for various water pipes was constructed from data on the number of leaking pipes recorded and stocked in the Tokyo district between 2001 and 2010 and the total pipeline length estimated for the last decade by age and type of pipe. Furthermore, the risk of regional accidents based on a future scenario was assessed by estimating the number of leakage accidents using the constructed model and a 250×250 meter mesh map of Tokyo. From the results, the important meshes with high risk were indicated quantitatively, which will be useful information for the pipe renewal planning.

A43: Analysis of monitoring programs of pesticides at water utilities using statistics on water supply

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Monitoring programs of pesticides at 1554 water utilities throughtout Japan were investigated using statistics on water supply. As the trends of the monitoring of the pesticides at the water utilities, the number of pesticides monitored became lagerer, as the annual frequency of monitoring became lower. Also, at the most water utilities monitoring pesticides, the pesticides were monitored at least once in spring to summer, the seasons that the tendencies of the detection of the pesticides were higher. On the other hand, the pesticiedes were not monitoterd at about 50% of water utilities. The percentages of the water utilities monitoring pesticides were higher, as the scales of the water utilities were lager. In most cases, the frequency of the monitoring of pesticides were less than four. There were a number of the water utilities that the frequency of pesticide monitoring was once. The percentages of the water utilities measured 102 pesticides, the all pesticides selected as management items, to total water utilities monitered pesticides were 34% for raw water and 25% for finished water.

A44: Toxity Identification Evaluation for the Effluent of the Selected Sewage Treatment Plants Focused on Residual Chlorine

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Japan Ministry of Environment started discussion on the management of industrial and municipal effluent using the bio-assays, and the test manual was publicized in March, 2013 as well as continuous discussion on the system installation. In the present study, short-term chronic toxicity tests were conducted for the effluents collected in Tokushima using the publicized method mainly referred to the USEPA's Whole Effluent Toxicity Test Methods, and the toxicants for three aquatic organisms, fish, daphnia, and algae, were characterized using the technique listed as Phase 1 in Toxicity Identification Evaluation (TIE) manual. As results, adverse effects were found for all three organisms for Plant A while relatively strong toxicity was found for algae and daphnia for Plant C effluent. The major toxicant for algae in both effluents was found to be residual chlorine confirmed by the significant toxicity reduction by the pretreatment using sodium thiosulfate and toxicity test for sodium hypochlorite.

A45: Iodinated Disinfection Byproducts in Drinking Water in Lake Biwa – Yodo River Basin

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A survery on iodinated disinfection byproducts (I-DBPs) and the speciation of iodine in dirnking waters in Lake Biwa –Yodo River Basin was conducted. Dichloroiodomethane concentration ranged from 20 to 253 ng/L. Chloroiodoacetic acid was also found in drinking water at approximately 20 ng/L. Iodoacetic acid, the most genotoxic haloacetic acid, was not detected for all the samples tested. Ozone/glanular activated carbon (GAC) treatment appeared to be effective for the reduction of I-DBPs. Iodate ion was the dominant form of iodine in drinking water. The contribution of unkwon organic iodine to adsorbable organic iodine tended to be larger than the sum of I-DBPs and X-ray contrast media.

A46: Behavior of chemical substances and toxicity in river basins by using GC/MS simultaneous analysis database and toxicity test of Medaka (*Oryzias latipes*) early fry with concentrated sample water

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We investigated relationship between behavior of chemical substances and toxicity in some basins dominated by residential area. We used GC/MS simultaneous analysis database for chemical analysis, and Medaka (*Oryzias latipes*) early fry bioassay using concentrated sample water for toxicity analysis. Conclusions were: 1. There were some rivers which contained chemical substances at the similar level as 50% fish Lethal Concentration (LC50) after 100 fold concentration. 2. It was difficult to explain toxicity on fish using known LC50 and chemical concentration obtained by GC/MS analysis. 3. Although most chemical concentration were relatively low in residential areas, toxicity became higher in basin of low sewered population. 4. When ratio of light industrial and/or commercial district was larger, chemical concentration tended to become higher. At the same time, toxicity also tended to become higher. 5. Composition of chemicals varied significantly within a short flow path of the rivers.

A47: Characterization of toxicants for three aquatics organisms in ambient water samples

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Various chemical substances are used in our industrial, agricultural, and daily activities, and are continuously discharged into the aquatic environment. Since the mixture effects of these compounds have become growing concerns, direct measurement of adverse effects of effluents or ambient waters on aquatic organisms has been frequently used. We had conducted short term chronic toxicity tests using algae, daphnia and fish refered to USEPA's whole effluent toxicity (WET) test method to evaluate the river water samples in our previous studies. However, no toxicant was identified in these investigations. So, in the present study, we collected seven samples in Tokyo metropolitan area, Osaka/Kyoto and Tokushima, and toxicants were characterized using the procedure of Phase I of Toxicity Identification Evaluation such as pre-treatment using solid phase extraction cartridges. As a result, cations such as metal ions are found to mainly contribute to the growth inhibition of algae. For daphnia, both cations such as metals and organic compounds are found to be major contributors to inhibit the reproduction, while organic compounds are major contributors for the inhibition of hatching and survival of fish.

A48: A study of treatment characteristics of wastewater containing PFCs by pulsed water-surface discharge system

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Treatment characteristics of wastewater containing PFCs by pulsed water-surface discharge system were investigated. PFOA and PFOS were used as examples of PFCs because these PFCs are recalcitrant and often detected in the environment. Pulsed water-surface discharge system can decompose and mineralize not only PFOA but also PFOS which is more stable than PFOA and can not be degraded by OH radical. Applied electric pressure and frequency can affect on the treatment efficiency, and their increase can enhance the efficiency. The efficiency can be raised by PFCs concentration, and identically-distributed discharge to water surface is also required for higher treatment efficiency. NaCl concentration of less than 1mg/L in wastewater does not give any negative effects, which indicate applicability to leachate treatment from landfill site of wastes. It is suggested that the pulsed water-surface discharge system can degrade PFOS in wastewater much more efficiently than the treatment system with UV irradiation.

A49: Ecological Risk Assessment of Highway Pollutants in terms of Propagation and Emergence Using *Chironomus Yoshimatsui*

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Highway pollution which is one of the urban nonpoint pollution is considered to have a influence on receiving water, because micro toxic substances like polycyclic aromatic hydrocarbons (PAHs) are exhausted from automobiles, etc. As most stormwater from highways washes off such pollutants from road surfaces and is discharged into the receiving water through stormwater drainages, it is important to know pollutant behavior in runoff process and its hazardous impact on ecosystem in the water body. The objective of this study is to survey standing stock and behavior of highway pollutants in their runoff process. It also aims at examining an ecological hazard impact of the highway pollution on the receiving water. As a result, it is shown that toxic level of the highway pollutants is high enough to affect propagation and emergence of *Chironomus Yoshimatsui*. And it is also shown that the influence of the highway pollutants on emergence does not depend upon only PAHs in the pollutants. In the results, some significant knowledge for the environmental management of urban pollution has been obtained.

A50: THE EFFECT OF REDUCTION OF AERATION PERIOD ON ORGANIC POLLUTANTS REMOVAL IN SEQUENCING BATCH ACTIVATED SLUDGE REACTORS

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The authors investigated the possibility to reduce aeration time in one of the cycles of sequencing batch activated sludge reactors. It is known that there are microorganisms in activated sludge which can store organic materials temporarily in such forms as polyhydroxyalkanoate (PHA). It was expected that removal of organic materials in the cycle with reduced aeration was supplemented by the microbial activities to store organic materials temporarily. The authors operated sequencing batch reactors with 6 cycles/day with synthetic wastewater, and reduced aeration in one of the cycles. Short-term experiments were conducted to see the effects of aeration reduction for one time, and long-term experiments were conducted to see the effect of long term implementation of operation with aeration reduction. In both experiments, removal of DOC was greater than 92%, and no significant adverse effect was observed. The more aeration was reduced, the more PHA was carried over to the following cycles. It was estimated that about 17% to 50 % of PHA was carried over to the cycles following the cycles in which aeration was reduced. The operation with one-cycle reduced aeration was successfully implemented in the experiments. There is a big room to explore wastewater treatment technologies in the direction to flexibly control energy consumption.

A51: Effect on influent of wastewater treatment plant in consideration of the emission factor of disposer wastewater and water quality variation in the sewer

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The recycling system of kitchen waste by using the direct discharge disposer, may contribute to the creation of a recycling society, but the spread is not promoting with the exception of some areas because the effect on the sewage facilities is a concern in Japan. In this study, we investigated the features of the disposer wastewater by water sampling in Isesaki city where direct discharge disposer has been introduced, and we calculated the emission factor. As a result, the emission factor of disposer wastewater was suggested SS is increased to about 4 times as compared to the kitchen wastewater do not use the disposer. In addition, an experiment assuming water quality changes in the sewer, we examined the effect of the influent wastewater of wastewater treatment plant with the emission factor. Effect of disposer wastewater is small at present, but if the disposer user has increased to about 25% of the population, we except SS will approximate to the design wastewater influent quality of wastewater treatment plant.

A52: A Study on the Use of Sewage Treatment Plant as a Base for Circulation of Water, Materials, and Energy in a Watershed

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A first step toward the goal of using a sewage treatment plant as a base for water, materials, and energy circulation in a watershed is to improve the independent generation of electric power by utilizing the organics including sewage influent. The energy potential was calculated from COD and the behavior in each process was studied. About 10% of the energy potential could be recovered by digestion gas generation, but most of the energy potential was lost in mineralization in the aeration tank and incinerator. The raising electric power independence was evaluated by "Required COD". Estimated values compared to 5800 mg/L in the case of a normal primary settling tank were as follows: 2800 mg/L (51% down) when the high-efficiency solids-liquid separation was introduced; 1800 mg/L (69% down) when activated carbon from sludge was charged; and 4900 mg/L (16% down) when a high-efficiency air diffuser was used. It may be concluded that electric power independence is difficult to achieve with any single method, but it might be achieved when these methods are combined.

A53: Case Study of the benefitial use of rain water in connection with water quality at the Rainwater Harvesting Experimental House to store heavy rainwater

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This paper indicates an advantage of the beneficial use of heavy storm rainwater at Rainwater Harvesting Experimental House. Rainwater harvesting is the use of rainfall on the roofs and storage runoff storm water under the storage tanks for urban flood control. In the simulation results, the significance of the storage of storm rainwater reservation is proved by many researchers. There is no private house which was built for the purpose of controlling urban flood damage, and the dispersed storage tanks effect is not yet demonstrated. We carried out the monitoring at the rainwater harvesting experiment house which was built in April, 2012 for the purpose of restraining an urban flood in this research. This study examines the possibility of the rainwater use and flood damage suppression effect by the construction of the rainwater harvesting house.

A54: An Investigation for Sustainable Approach to a Site Contaminated with Chlorinated Volatile Organic Compounds Using Simplified External Cost

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The sustainable protocol to remediate contaminated soil, followed by the external cost analysis, is proposed to simplify the steps for sustainable remediation or sustainable green remediation. This paper provides a site case study, which is widely contaminated by trichloroethylene and cis-1,2-dichloroethene in Japan. Authors selected the relevant parameters from sustainable categories and parameters, and integrated those parameters by external cost unit, which are applicable for Japan. Onsite soil heating had the lowest total cost of the three soil remediation techniques in this study. The approach for sustainable remediation can be modified to suit the conditions in individual site conditions, therefore the simple and perspicuous way proposed in this work would be widely acceptable as an entrance to sustainable remediation in Japan.

A55: The Efeects of Global Warming on Phytosynthesis of Seagrass: Change of Water Temparature and Sea Level

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Seagrasses contribute greatly to the biodiversity of coastal areas. However, there have been big influence of global warming that may affect on marine organisms, especially the seagrasses. In this study, we focused on Zostera japonica which inhabits in intertidal and shallow subtidal zones, there is almost no information on the impact of global warming on this seagrass. We measured and modeled that the photosynthsis and respiration rates in Z. japonica and Zostera marina on the various water temperature and photon flux density. Moreover, we investigated by using this model and the IPCC A1B scenario the effect of global warming on seagrasse. At the result, It was estimated Z. japonica will be strongly influenced by the sea level rise than the water temperature increase in the future.

A56: Evaluation Method on Fishes Habitation Place in a Small-Scale River

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"Basic guidelines of nature-oriented river management" was notified in October, Heisei 18, and the explanatory booklet of technical standard "point II and III" was drawn up in Heisei 20 and 22. For example, when fish habitats are preserved and repaired, the system which can verify whether a design is appropriate or not is needed in the future. However, in business, the actual condition still grasps the characteristic of a river using an explanatory booklet of technical standard and judges adoption experientially. Therefore, PHABSIM is mentioned as a method of grasping and evaluating environment suitable for habitation of fishes. So, in this research, the four monotonous sections and the three diversity sections in two rivers, were investigated, and Fish Population Density and the relation of the index of diversity were confirmed. Moreover, data about the fastidiousness to the flow velocity of individual fishes, depth of water, and a substratum was able to be obtained from much literature in the work. Based on the data obtained here, we propose fishes habitat evaluation method useable in business in a river channel plan.

A57: Effects of natural selection on genetic diversity of freshwater insect *Stenopsyche marmorata* populations

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Environmental heterogeneity among habitats may be one of the factors causing adaptive genetic divergence in wild populations. We examined the effect of natural selection on genetic diversity of Stenopsyche marmorata population in middle of Miyagi, Japan. Eight microsatellites were employed to draw genetic structure and tested for their neutrality. Three microsatellites were estimated to be presumably under the selection and 4 microsatellites were nuetrall. Genetic diversity at selective loci showed significant positive partial correlations with food condition (SS, FPOM, chlorophyll a within surface biofilm, FBOM) and riverbed heterogeneity (average size of pebbles, uniform coefficient of sediment). It support that linked geanes with lower fitness could exist under habitats with abundand foods and variable sediments. This results suggest a risk of decrease of genetic diversity by artificial environment disruption.

A58: Variability characteristic in the Growth of Nuttallia olivacea

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Now a days, bivalve population is decreasing in tifal flat. The objective of this study is to focus on the growth situation (BM) of bivalve (Nuttallia olivacea) and their food sources. Indeed, it is used as a maker of food resource, based on carbon stable isotope (SI), composition of fatty acids (FA) and fatty acids specific stable carbon isotope (FA-SI). The results showed that SI of the bulk sample do not have any relation with BM. However, the compotision of FA revealed that EPA and DHA were useful nutrients for bivalve BM.Furthermore, FA-SI showed that the terrestrial EPA and DHA contribute to decrease, bivalve BM value. Therefore, it was considered terrestrial organic matter of food source is important element in the bivalve growth.

A59: Models for Reversible and Unreversible Inhibitions of Biological Nitrite Oxidation

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Biological reactions often experience inhibition conditions from high concentration of substrate, reaction products or other external inhibitory compounds. The inhibitory compounds may affect the enzymatic system leading to different forms of competitive, non-competitive or uncompetitive reversible enzyme inhibition. In other situations, the concentration of inhibitory compound could result in enzyme poisoning leading to irreversible inhibition. There are several mathematical models to express reversible inhibition, however recovery/adaptation phenomenon is not well described by these models. Furthermore, the modelling approaches for unreversible inhibitions are not well developed. In this study, dynamic response of oxygen uptake rate from nitrite oxidising batch experiments were used to develop models for reversible and irreversible inhibitions. The OUR batch tests from nitrite oxidation experiments conducted for nitrite-N concentration range of 125-2,000 mg-N /L revealed that the inhibition effect of free nitrous acid (FNA) and free ammonia (FA) disappeared after several hours due to microbial adaptation from the shock loading. The OUR tests also indicated irreversible inhibition (poisoning) leading to permanent reduction in activity at higher doses of inhibitory compounds For the reversible inhibition a time-dependent switching function was defined to express the degree of the adaptation. The irreversible poisoning phenomenon was defined as an additional first-order type decay/death process that was initiated when the inhibitory concentration exceeded the threshold level. The modified model developed from the batch experiments data was able to reasonably reproduce the effluent nitrogenous concentration in the WERF benchmark dataset of over 250 days.

A60: The Start -up and Inhibition Analysis of Anammox Process in a UASB Reactor Using Activated Sludge and Anaerobic Digestion Sludge as Seed Sludge

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The Anammox system was started up with 2L of activated sludge and 3L of anaerobic digestion sludge in a UASB reactor. After 140 days enrichment, the Anammox system was successfully started up. The ammonium removal efficiency reached to near 99.5%. HRT was shortened from 24h to 3h step by step to increase the NLR to 1.68g/L/d. During the steady state, the NRR reached to 1.46g/L/d, and the consumption ratio of NH_4^+ to NO_2^- was in the range of 1.0~1.1. Substrate concentration shock was also investigated in the experiment. In the continuous experiment, when the concentration of FA and FNA was higher than 20mg/L and 7μg/L, the Anammox system was 60% inhibited. In batch experiment, the inhibitory threshold concentration of FA and FNA was 78mg/L and 30μg/L which was higher than that observed in continuous experiment. The results indicated that the recovered Anammox sludge has stronger resistance for high substrate concentration.

A61: Polyphosphate-accumulating organisms capable of living under high salinity environment

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The existence of marine polyphosphate-accumulating organisms (PAOs) living under high salinity environments is little known. We attempted to make an enrichment culture of the uncultured marine PAOs by using a closed down-flow hanging sponge (DHS) reactor. The DHS reactor inoculated with some tidal flat sediment was fed with a synthetic seawater containing phosphate. After 130 days of the operation, a stable phosphorus release and uptake were observed in the anaerobic and aerobic phases, respectively, indicating that the enrichment of marine PAOs was successfully made. Microbial community analysis by 16S rRNA gene targeted cloning revealed that under the acetate and propionate feeding condition, Accumulibacter, which is the major PAO in wastewater treatment plants, was dominant in the DHS reactor. When the anaerobic substrate was changed to only acetate, the percentage of Accumulibacter decreased, and an unknown filamentous PAO dominated. These results suggest a possibility of the enhanced biological phosphorus removal even under high salinity conditions.

A62: Identification of denitrifying bacteria through single cell analysis with simultaneous detection of nirK gene and rRNA by using two-pass tyramide signal amplification fluorescence in situ hybridization

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We developed a method for single cell analysis with simultaneous detection of a functional gene and rRNA by using two-pass tyramide signal amplification-fluorescence in situ hybridization (TSA-FISH) for identification of denitrifying bacteria in activated sludge from a night soil treatment plant. The new method enabled simultaneous detection of the nirK gene and rRNA from pure cultures at a high detection rate. Microbial communities in the sludge were identified using cloning analysis based on rRNA genes and the nirK gene. On the basis of the results of microbial community analysis, we designed probes targeting rRNA and the nirK gene. Simultaneous detection of nirK gene and rRNA identified Hyphomicrobium as a denitrifier in the sludge.

A63: Bacterial Community Structure of Practical-scale DHS Reactor Treating Municipal Wastewater by UASB-DHS System and Quantification of Denitrifying Bacteria

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Bacterial community structure in municipal wastewater treatment practical-scale 3rd generation (G3) and 6th generation (G6) type Down-flow Hanging sponge (DHS) reactor was investigated by rRNA clone analysis and real-time PCR analysis. 16S rRNA gene clone-based analysis revealed different microbial composition between high-water-temperature period and low-water-temperature period was observed. Clone-based bacterial diversity was increased in high-temperature period. By contrast in low-temperature period, those composition was dramatically changed to lower diversity. Denitrifying bacteria was quantified by real-time PCR, which indicated that denitrifying bacteria were present in a ratio almost the same amount regardless of the height of the reactor. PCR-based quantifying analysis also revealed that DHS sponge can be retained denitrifying bacteria as well as activated sludge process.

A64: Difference of the Origins of Fine Particulate Organic Matters Between Lotic and Lentic Habitats in Downstream Reaches of Dam Reservoir

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Dams often supply large amount of Fine Particulate Organic Matters (FPOM) orginated from dam reservoirs (called “dam-POM”) to their downstream reaches. It potentially leads to a shift of trophic sources of stream faunal communities from the stream-origins (e.g., periphyton and terrestrial input) to the dam-origin organic matters. However, the lentic habitats at dam outlet reaches such as backwater and isolated pool may receive a lot of terrestrial and autochthnous organic matters, thus we need habitat-specific tests regarding the trophic dependency on dam-POM. The aim of this study is to qularify the spatial variation of trophic contribution of dam-POM between lotic and lentic habitats at dam downstream reaches. The proportion of contribution of dam-POM to Suspended FPOM and Benthic FPOM was quantified at each habitat using a mixing source model with carbon and nitrogen stable isotopic data. The results support the habitat specific patterns showing higher contribution of dam-POM to Suspended FPOM in lotic habitats than lentic habitats. It suggests the ecologically important role of lentic habitats in locally sustaining insitu trophic structures of stream ecosystem in the impacted reaches by dams.

A65: Reserch on Wind-Induced Reaeration in a Small Scale Closed Water Body with Covered Water Surface

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In a closed water body, covered water surface reduces a wind impact which can provide dissolved oxygen in the water, due to a reduction of acting water surface by wind. This covered surface impact might suggest some important issues for water quality management in a closed water body. In this research, in order to clarify an impact of covered water surface on wind characteristics and dissolved oxygen supply by wind, wind tunnel test tank experiments were conducted. As a result, correlation between mass transfer coefficient and both wind friction velocity and Schmidt number were elucidated and quantitative expressions for the coverage impact were developed by using these correlations. In addition, the impact of the surface coverage was summarized by estimation formula of mass transfer coefficient.

A66: Analysis of sedimentary organic carbon dynamics in Lake Izunuma using by current flow and fatty acid biomarker

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Eutrophication in closed water areas have been one of the most serious environmental concerns in all over the world. Not only water quality but also bottom sediment quality should be improved against for eutrophication. We investigated current flow, sedimentary organic carbon and fatty acid composition of bottom sediments in Lake Izunuma which is one of the most famous closed water lakes as eutrophic lake in Japan. There was negative relationship between exceedance probability of current velocity and sedimentary organic matter. Fatty acid analysis revealed the origin of organic carbon in bottom sediment was mainly higher plants. These results indicated the control of current flow and higher plants are required to manage closed water area.

A67: Loadings of polycyclic musks and triclosan in separate sewage treatment plants and coastal marine sediments in Hiroshima bay area

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The concentrations and mass flow rates of three polycyclic musk fragrances OTNE, HHCB, and AHTN, a bactericide triclosan were examined in a sewage treatment plant and coastal marine sediments in the Hiroshima bay area, Japan. Based on the results, the total emission and sedimentation loadings in the bay area was evaluated. The total sewage influent loadings in the area were estimated to be 200–1000 kg yr^{-1}, respectively, whereas the effluent loadings from sewage treatment plants were 0–600 kg yr^{-1}. The sedimentation loadings in the bay area were far lower than the effluent loadings and were 0–4 kg yr^{-1}, respectively. Further, the concentrations of related chemicals were measured and their behaviors were discussed.

A68: Estimation of Pollutant Mass Balance and Behavior from Rice Paddy Fields Based on Field Surveys

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Pollutant runoff from rice paddy fields is one of the most important topics of non-point pollution around Lake Biwa which is the largest lake in Japan. In this study, surveys on pollutant runoff from the paddy fields around Lake Biwa were done for 3 years from 2007 to 2009 during farming periods. In the surveys, samples were collected by continuous water sampling, and chemical substances in each sample such as SS, TN, TP and COD were measured for particulate and dissolved forms respectively. Using results of the surveys, characteristics of pollutant behaviour in the paddy fields during the farming periods were examined. And basic unit runoff loads of pollutants from the paddy fields throughout a farming period were cleared. As a result, some significant knowledge for the environmental management of paddy fields has been obtained.

A69: Methane Fermentation of Coffee Waste by Thermophilic AnMBR

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Coffee Grounds are deemed to be difficult substrates for thermophilic anaerobic digestion due to its complex composition and unknown system inhibition. This work investigated the biodegradability of coffee waste by batch experiment and the feasibility of long term operation of the AnMBR. COD conversion efficiency of 75% and methane yield of 290mlCH_4/g-CODadded was obtained in batch experiment. The amendments of alkalinity and micronutrients was obligatory to maintain process stability in long term experiment. Mixing sludge 15% into substrate enhanced the stability of system. Biogas production of 1.93L-Biogas/L-reactor•d and methane contents of 60.6% was obtained in co-digestion process. Membrane operation continue 139 days without significant decrease of flux.

A70: Mesophilic co-digestion of dewatered sludge produced in a oxidation-ditch process and wasted fried tofu

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In many small cities, an oxidation ditch (OD) process is widely used in a wastewater treatment plants, and a large amount of dewatered OD sludge is generated. Meanwhile, a lot of organic wastes are being generated from food manufacturing processes. However, if co-digestion of dewatered OD sludge and organic wastes is conducted, it is possible to promote the digestion efficiency in a sludge treatment processes. Moreover, co-digestion under high-concentrated condition enables scaling down of the sludge treatment process. In this study, continuous co-digestion experiment using high concentration OD sludge and fried tofu was conducted under mesophilic condition. The digestion progressed stably when organic loading rate was 3.4kg-VS/m3/d (OD sludge) and 3.5kg-VS/m3/d (fried tofu mixture). By controlling the substrate organic loading rate, co-digestion using high concentration OD sludge and organic wastes is applicable for small scale facilities.

A71: Anaerobic Digestion Characteristics for Sewage Sludge and Organic Wastes by Batch Experiments

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Co-digestion of sewage sludge and other organic wastes is a promising technology. Anaerobic digestion characteristics for organic wastes, including sewage sludge, food factory waste, kitchen garbage, livestock waste, and vegetable waste, were analyzed by batch experiments using digested sludge adapted to these wastes in advance. The COD base methane conversion ratios in mesophilic and thermophilic conditions were similar and around 0.6 (-) or over. The reaction rates for wastes with higher methane conversion ratios were faster. The effects of substrate compositions on digested sludge quality such as ammonia, phosphate and potassium concentrations were quantitatively evaluated. These results can be used to evaluate co-digestion performances in different areas.

A72: Effect of Temperature and Ammonia Inhibition on Methane Fermentation of High Concentrated Chicken Manure

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High concentrated chicken manure with about 10% of TS was fed to reactors for continuous mesophilic and thermophilic fermentation to evaluate the performance of biogas production and the ammonia inhibition. Stable mesophilic fermentation was achived even though raw chicken manure was fed as substrate. Thermophilic fermentation was successfully achieved feeding ammonia stripped chicken manure. On the contrary, ammonia inhibition was found to thermophilic fermentation when fed with raw chicken manure. By means of estimating biogas production, ammonia inhibition to mesophilic and thermophilic fermentation began to occur when the concentrations of ammonia were in a range of 4000～5000mg/L and lower than 4000mg/L, respectively. Sharply VFA accumulation occurred when TAN concentration was about 10000mg/L in mesophilic fermentation and 5000mg/L in thermophilic fermentation. In addition, with the increase of TAN concentration, there was a trend that degradation rate of oganic matters decreased. And it was obvious that protein was especially sensitive to ammonia inhibition comparing to the other oganic matters.

A73: Development of methane fermentation technology without heating for beverage industrial wastewater treatment by an expanded granular sludge bed

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In this study, an expanded granular sludge bed (EGSB) reactor was applied to the low strength (about 1,000 mg-COD/L) beverage industrial wastewater treatment at low-temperature (17-19°C) in order to evaluate process performance. As a result, the EGSB reactor achieved 15 kg-COD/(m^3・d) at the day 65. The COD removal and the methane gas conversion rate were 88 - 93%, and 60 - 69% respectively. At this time, COD sludge loading was 0.63 kg-COD/(kg-MLSS・d). The EGSB reactor operated at low-temperature achieved the good treatment efficiency as with a mesophilic EGSB process. Distribution of particle diameter of retained granular sludge tended to increase during operation, on the other hand the sludge possessed the stable settleability. As results of methanogenic activity measurement of the retained sludge, the methanogenic activity at low-temperature (20°C) reached the same level as mesophilic (35°C) activity of seed sludge by proliferation of methanogens with low-temperature tolerability. This microbial acclimation of the retained sludge contributed for stable operation of the EGSB in an unheated condition.

A74: Practicability of molecular analysis for testing Cryptosporidium and Giardia in water

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To investigate practicability of molecular analysis for testing Cryptosporidium and Giardia in water, these protozoans in raw water obtained from 30 Japanese drinking-water treatment plants were tested by conventional microscopic observation and molecular analysis, and the results were compared. Detection sensitivity of two methods resembles each other if RT-qPCR is used as a molecular analysis method. On the other hand, the quantified concentrations of Cryptosporidium detected in a few raw waters by RT-qPCR were much lower than those by microscopic observation. Molecular analysis revealed that species and/or genotypes of protozoans in raw water are ecologically diverse, and most species and/or genotypes are potentially infectious for humans. Furthermore, it was found that contamination sources of protozoans in water sources can be predicted depending on detected species and/or genotypes by molecular analysis.

A75: Identification of Norovirus in Sewage by Using Pyrosequencing

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In order to prevent the spread of viral infectious diseases, it is necessary to detect and identify pathogenic viruses especially emerging strains as early as possible. However, only major strains which present in large amount in samples can be identified using conventional methods. In this study, pyrosequencing method was employed to identify genotypes of Norovirus in wastewater. By constructing operational taxonomy units (OTUs) from the observed sequence reads, we succeeded in detecting genotypes of minor Norovirus genotypes such as GI/6 and GII/2 in addition to the major strains, GI/14 and GII/4. It was also revealed that the denoising process was necessary to construct reliable OTUs.

A76: Case study in quantitative microbial risk assessment of reclaimed water by the ultra filtration membrane process for agricultural irrigation

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An international standard to use reclaimed water safely is being considered in order to solve global water problems. Its future enforcement to promote the use of reclaimed water is planned for the future. When reclaimed water is used for various purposes, it is especially important to assess its microbial risk. This report describes a study of the quantitative microbial risk assessment for farmers and consumers of reclaimed water based on a case study of using water reclaimed by the ultra-filtration membrane process in a pilot plant for agricultural irrigation. The calculation results, which compared the microbial risk to consumers of water treated using the ultra-filtration membrane with the microbial risk to consumers of river water, when both are used for agricultural irrigation, confirmed the risk reducing effect of the ultra-filtration membrane process.

A77: Detection and quantification of Norovirus in oysters using low pH elution and enzymatic virus elution methods

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Effect of pH in elution buffer on efficiency of viral extraction from oysters was examined. Then, efficiencies for detection and quantification of Norovirus from oysters were investigated with comparing two virus extraction methods employing the elution buffer at optimal pH and enzymatic virus elution by amylase. Extraction efficiencies of murine norovirus, which was used as internal control, from oysters indicated employment of elution buffer with lower pH resulted in higher efficiency of virus detection and that was higher than when amylase digestion was employed. On the other hand, amylase treatment was shown to be more efficient than low pH elution method for quantification of Norovirus accumulated in cultured oysters. Digestion by amylase is suggested to be effective to facilitate desorption of Norovirus from organic compounds in digestive diverticlum of oysters.

A78: Spatial and Temporal Variation in Concentration of F-Specific RNA Bacteriophages in an Open Channel Receiving Johkasou Effluents

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An open channel receiving the johkasou effluents may play a role in transmitting several contaminants into the aquatic environment downstream, including viruses that cannot be completely removed by the johkasou system. To assess the contamination of viruses in the open channel receiving the johkasou effluents, the spatial and temporal variations of the concentration of F-specific RNA bacteriophages, as model enteric viruses, were examined both in water and sediments. The investigations were carried out at six sites along an open channel in a residential area (Gifu, Japan) from September 2011 to January 2013. F-RNA bacteriophages and Qβ were detected in the open channel ranging from 0 to 102 PFU/mL and from 102 to 104 eqPFU/mL in water, and from 0 to 102 PFU/mg and from 102 to 104 eqPFU/mg in sediment. Significant spatial variations in the concentration of F-RNA bacteriophages were found possibly due to the contribution of sources along the open channel. Significant temporal variations in the concentration of F-RNA bacteriophages were also observed both in the johkasou effluents and in the open channel. A significant positive correlation of F-RNA bacteriophages with VS and DS suggests possible interactions of viruses and sediment particles that seem to be carriers of viruses in the open channel.