A1 Development and Evaluation of a Ring-Shaped Water Disinfection System using UV Light Emitting Diodes

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A UV light emitting diode (UV-LED) is an attractive UV light source that is free of mercury and lead, robust against shocks and small. In this study, we developed a ring-shaped UV-LED module to be attached to the outer wall of quartz cylinder. Inactivation efficiencies of *Escherichia coli* and coliphage Qβ were measured and the hydraulic condition inside the cylinder was simulated by a computational fluid dynamics (CFD) software. As a result, the inactivation efficiency of the module was significantly affected by the hydraulic condition. In addition, we examined the characteristics of the module by calculating the distribution of flow rate and dose rate inside the cylinder.

A2 Effects of conditions of two-step chlorination on trichloramine formation potential

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The effects of types of water (raw waters and waters after sedimentation-coagulation at water purification plants) and conditions of two-step chlorination on trichloramine formation potentials (NCl_3-FPs) were investigated. Like the cases of the pervious study, the effects of two-step chlorination were observed when ammonia was a main NCl_3 precursor in waters. The reduction of NCl_3-FP by two-step chlorination in both raw waters and waters after sedimentation-coagulation was shown and the difference was not observed for the reduction of NCl_3-FP by two-step chlorination. It was shown that several hours were required until second chlorine addition for NCl_3-FP control. As for pH (6-8) until second chlorine addition, pH 7 was the highest for NCl_3-FP control. The effects of two-step chlorination on trihalomethane (THM)-FP were low regardless of types of waters and chlorination conditions.

A3 A Study on Simulation Model for the Chlorine Residuals Decrease in Receiving Tank with Unsteady Inflow and Outflow

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For water service, it is an important issue to control and to reduce the chlorine residuals concentration during water transmission and distribution process. Especially water supply with recieving tank carries considerable risks due to its long residence time owing to the random water use for a small congregation. Utilizing data from examinations on water quality of small recieving tanks, the purpose of this study is to devise a simulation model for the decrease of chlorine residuals concentration in tank with intermittent inflow and outflow. By the combined use of the first order reaction rate reflected from the TOC components and the model for complete mixing of inflow and storeged water in tank, we were able to describe the chlorine residuals decrease under some conditions concerning the turnover rate of recieving tank and/or the reduce of chlorine residuals concentration in inflow.

A4 Application of ATP analysis for rapid screening of viable microbes in the course of dialysis water production process

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Applicability of adenosine triphosphate (ATP) assay for rapid screening of viable microbes in raw water and in the course of dialysis water production process was examined in this study. Samples were collected from Hospital A, where water for medical care was supplied by both public water supply and private water supply from groundwater. Viable microbes were robustly detected when ATP exceeded 5x10^-13[mol/ L] , however, there was not significant correlation between total viable microbial count (TVC) and ATP. Twentyfold concentration of the samples could increase detection sensitivity of ATP except for dialysis fluid. The ATP assay would be considered as complementary to conventional TVC monitoring in terms of rapid screening of the presence of viable microbial contamination for ensuring microbial safety of dialysis water on a daily basis.

A5 Behavior of particulate elements and bacteria in a water distribution pipe system

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Particulate elements and bacteria in a water distribution system have so far been investigated individually. Therefore, comprehensive behavior of particulate elements and bacteria is still unknown. In this study, the behavior of particulate elements and bacteria and the relationship between them were examined by taking water samples from hydrants in a water distribution system. Particulate elements concentration varied spatially. In addition, the composition of particulate elements differed between sampling sites at a distance of 270 m. These results indicated that most particulate elements accumulated near the pipe in which they were generated. On the other hand, quinone concentration varied. The change in quinone concentration had a trend similar to that in particulate elements. Therefore, bacteria behave in the same manner as particulate elements.

A6 Cloning and expression of genes encoding violacein biosynthesis for inhibiting protozoan predation

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Violacein is a natural violet pigment that is produced by several bacterial strains. It has an antiproto-zoal property. Violacein-producing genes, vioABCDE, were obtained by PCR from two strains of Chromobacterium violaceum and two strains of Janthinobacterium lividum, respectively. A pBR322 derivative plasmid vector, pKNA94, was used for cloning of the genes, and they were expressed under the control of trp promoter in Escherichia coli JM109. Transformants of E. coli JM109 having each vi-oABCDE developed violet colonies. The colony of transformant having the genes from C. violaceum JCM1249 showed the strongest violet color. The transformant was used for grazing experiments with bacterivorous protozoa isolated. Protozoan grazing was remarkably inhibited, and it was found that the violacein producing recombinant had a strong antiprotozoal activity.

A7

A8 Study on Behavior of Perfluorocarboxylic Acids in Wastewater Treatment Plants in Consideration of the Formation Potential from Their Precursors

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Main objective of this study was to examine the behavior of perfluorocarboxylic acids (PFCAs) dur-ing treatment processes at a WWTP by (a) analysis of PFCAs at each treatment process (b) study on the examination methods of formation potential of PFCAs from their precursors in wastewater samples (c) calculation of mass flow of PFCs through treatment processes in consideration of the formation potential from their precursors. As a result; a) PFOA and PFNA concentrations were increased through treatment processes and more than 200 % of the mass in the effluent were returned to the aeration tank with return sludge. b) Oxidation process with potassium persulfate under alkaline condition resulted in evaluating 317 ng/L of PFOA formation potential (4.5 times higher than original concentration) and 929 ng/L of PFNA formation potential (5.0 times higher than the original) in return sludge. c) PFCAs were not balanced during the biological treatment and secondary settling processes while those resulted in being better balanced by considering the mass of formention potentials of PFCAs.

A9 Effects of Anions on Perfluorohexanoic Acid Adsorption onto Anion Exchange Polymers, Non-ion Exchange Polymers and Granular Activated Carbon

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Perfluorohexanoic acid (PFHxA) is increasingly used in industries and widely detected in water environment. Conventional wastewater treatment plants are ineffective to treat PFHxA. Therefore, effective removal techniques are required to minimize health risks and environmental impacts. In this study, adsorption capacities of PFHxA onto three strong base anion exchange polymers (PFA300, PFA400 and A860), two weak base anion exchange polymers (BA103 and MN102), non-ion exchange polymers (XAD4) and granular activated carbon (GAC) were studied by batch experiments. Effects of chloride, sulfate and nitrate ions on the PFHxA adsorption were investigated for all adsorbents. The Freundlich equation was fitted with the equilibrium adsorption data. BA103 exhibited the highest adsorption capacity (412 mg/g) because it had the highest exchange capacity. Amounts of PFHxA adsorbed onto adsorbents decreased when chloride, sulfate and nitrate ions increased in the solution. Nitrate ion had more effects on the adsorption capacities of PFHxA than sulfate and chloride ions. BA103 had the highest adsorption capacity of PFHxA in presence of chloride, sulfate and nitrate ions. BA103 showed as an effective adsorbent to remove PFHxA in water/ wastewater.

A10 Change Inhibition Effect of Sex-Specific Genes Expression in the Medaka with Nanofiltration and Reverse Osmosis Membrane Filtration

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The gene expression that swiftly reacts to external stimulation can be applied to the rapid evaluation of the biological effect of fish. Sex-specific genes of medaka were searched using microarray in order to evaluate the estrogenic activity of the fish; the evaluation required an exposure time of 96 h. We evaluated the reduction of the estrogenic activity by the nanofiltration (NF) and reverse osmosis (RO) membranes using the feminization factor calculated from the genes expression profile. The average reduction ratios of the feminization factor for the NF and RO membranes were 47% and 95%, respectively.

A11 Enhanced Removal of Odors and Trihalomethane Precursors by Combined Application of Supper-Powdered Activated Carbon Adsorption and Chemical Enhanced Backwashing in Membrane Filtration

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Long-term pilot scale membrane filtration experiments were conducted to evaluate the effects of combined application of adsorption by supper-powdered activatedcarbon (S-PAC) and chemical enhanced backwashing (CEB) on the removal of odors and trihalomethane forming potentials (THMFPs) in membrane filtrationfor treatment of raw water containing higher concentrations of algae. The obtained results demonstrated clearly the combined application of CEB could effectively inhibit membrane fouling and, at the same time, could alleviate the risk from byproducts formed when pre-chlorination was applied as a pretreatment process for controlling membrane fouling. The results also demonstrated clearly that, with the combined application of adsorption by S-PAC, the removals for THMFPs, 2-MIB and geosmin could be greatly enhanced; and membrane fouling could also be controlled.

A12 Examination of control factor in ozone/peroxide treatment.

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The strongest factor against bromate formation was dissolved ozone concentraiton even in the case of mixture of hydrogen peroxide. The decomposition rate of odorous substances were proportional to the amount of ozone consumption, regardless of the existence of hydrogen peroxide. When the water tem-perature is low, it was effective to set the hydrogen peroxide dosage to value that can sufficiently decom-pose the supplied ozone, and to set the ozone dosage corresponding to the load of the odorous substances at the same time.

A13 CATALYTIC OZONATION OF AMMONIUM ION IN DILUTE AQUEOUS SOLUTION

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To better control trace ammonium ion in water, an important precursor of chlorinous odor of drinking water, the oxidation characteristics and mechanisms of ammonium ion in catalytic ozonation was investigated through a serious of semi-batch oxidation experiments with a dilute aqueous solution at room temperature. Our results show that oxidation of the ammonium ion in catalytic ozonation is initiated by adsorption ammonium ion onto the catalyst surface, and that the role of hydroxyl radical is negligible. In addition, the oxidation of the ammonium ion was enhanced by some co-existing substances (i.e., chloride, calcium, acetate, and oxalate ions). That is, co-existing substances play a major role in catalytic ozonation.

A14 Development of the evaluation method on the fire protection capacity of water supply networks based on disaster resilience curve

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The purpose of this study is to develop an evaluation method on the fire protection capacity of water distribution system from the viewpoint of business continuity. In this study, an evaluation model based on disaster resilience curve, which could describe disaster mitigation and resilience in water service, was developed. The distribution network analysis including emergence of the fire extinguishing quantity of water was carried out, the number of node available as fire hydrant was calculated in accordance with the requirements of hydraulic pressure at nodes. The fire protection capacity of the water distribution system in the emergency restoration period for the actual distribution network of the Kobe City was evaluated with the numerical evaluation model. Then, an evaluation procedure on the fire protection capacity of water supply distribution system based on disaster resilience curve was proposed. As a result, it was pointed out that disaster prevention for reliable water supply system would require not only mitigation but also resilience.

A15 COST REDUCTION THROUGH THE BUSINESS INTEGRATION OF REGIONAL WATER SUPPLY AUTHORITIES AND DEPARTMENTS
A CASE STUDY ON ISHIKARI RIVER BASIN IN HOKKAIDO, JAPAN

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Business integration of regional water supply authorities and departments, which are currently administrative unit each belonging to municipalities, is regarded as an effective solution for the sustainable water supply service in the circumstance of depopulation, increased investment in replacement, maintenance and repair of facilities, and insufficient technology transfer to the next generation. In this paper, we proposed methods to quantitatively predict the reduction of population served, water consumption, and replacement ad reconstruction costs with considering down-sizing of facilities, etc. By applying the methods to 73 water works authorities and departments in Ishikari River Basin (area: 15,000km2, people: 3,100,000, 46 cities & towns), scenario analyses was conducted to estimate the revenues and expenses in the next coming 40 years. Without the integration of the regional water supply authorities and departments, large intra-regional differences in the costs to water supply were estimated. The costs at the year 2050 ranged from 200 up to 600 yen/m3. However, it was 249 yen/m3 in the case of the integration. Integration yielded the annual cost reduction of 1.7 billion yen, which was 3.3 % of the annual revenue expenditure.

A16 ASSESSMENT OF ADAPTATION CAPACITY TO CLIMATE CHANGE USING MANAGEMENT INDICATORS FOR WATER UTILITIES

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Climate change may affect the quality and the quantity of water supply systems; however, the likelihood of climate change impacts varies among water utilities. Hence, this research aims to develop the Combined Performance Indicators (CPIs) that integrate the likelihood of climate change impacts and the capacity of water utilities to mitigate such impacts. The CPIs were developed for each process of water supply; namely, intake, treatment and distribution processes. The calculated CPI values were grouped in terms of the service population and the regions of the water utilities, and were plotted on the map of Japan. It was found that the adaptation capacity of water utilities varied depending on their sizes and geographical locations. The adaptation capacity of small-scale water utilities in particular were found to be significantly diversified and some of them are extremely vulnerable to climate change. Furthermore, comprehensive assessment of water utilities' adaptation capacity to climate change was carried out using the management indictors for water utilities that include two additional indicators for finance and pipe age. It was demonstrated that the proposed management indicators for water utilities can be used to develop an adaptation plan for each water utility.

A17 STUDY OF OPERATING METHOD FOR IMPROVEMENT PERFORMANCE IN A DHS REACTOR WITH PURE OXYGEN SUPPLY TREATING STARCH WASTEWATER

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A high dissolved oxygen Down-flow Hanging Sponge (Hi-DHS) reactor was applied as a treatment of starch wastewater. The purpose of this study was to evaluate a difference in performance of Hi-DHS reactor due to wastewater component, and to investigate an operateing method for improvement performance of Hi-DHS reactor. Total COD and total BOD of starch wastewater was 1016 and 565 mg/L respectively. At an HRT of 5 h, organic loading rate was 1.4 kg-BOD/m3-reactor/d, effluent soluble BOD was over 50 mg/L. This was due to a short cut flow and a shortage of DO supply.Then effluent recircuration was applied to improve these phenomenons. Then effluent soluble BOD was around 25 mg/L. Effluent recircuration suggested that this was a easy method to control biofilm thickness.

A18 HIGH ORGANIC LOADING TREATMENT OF MOLASSES WASTEWATER BY COMBINED SYSTEM CONSISTED OF THERMOPHILIC MULTI-STAGED UASB REACTOR AND MESOPHILIC UASB REACTOR

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We investigated performance of the combined system consisted of a thermophilic (55ºC) multi-staged upflow anaerobic sludge blanket (MS-UASB) reactor and a mesophilic (35–40ºC) UASB reactor for a high strength molasses wastewater treatment. In MS-UASB reactor at OLR of 42 kgCODcr･m-3･d-1, the average removal rates of CODcr and BOD as the combined system were archived up to 82% and 90%, re-spectively. By microbial community analysis, high levels of genera Thermacetogenium and Methan-othermobacter were observed in the granular sludges retained on MS-UASB reactor. It indicates that electron flow for methane production was depended on the way combined acetate oxidizing hydrogen production and hydrogen utilizing methane production.

A19 Effect of polymer coating to membrane on membrane fouling in the MBRs

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Effect of polymer coating to membrane on membrane fouling control in MBRs was measures in a laborator-scale MBR reactor. Mixture of MBR polymers and PVA was coated to PVDF MF membrane and hydrophobic properties of coated polymers was measured.Conducting a long-term operation using the submerged MBR reactor, it was found that Coated membranes showed better performances compared tonon-coated PVDF membrane. E260 in the membrane permated and DOC removal rate in the membranes revealed that coated polymers prevented adsorption foulants such as proteins onte membrane surfaces and mitigated fouling phenonomena in MBRs.

A20 MEASUREMENT OF VIBRATION PATTERNS OF FLAT-SHEET MEMBRANE MODULE INDUCED BY AERATION USING LASER DISPLACEMENT METERS IN MBRS

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This study investigated the vibration pattern of flat membrane modules used in submerged MBRs by a laser displacement meter. The supporting plates of the membrane modules showed repeated expansion and contraction behaviors during aeration. Fluctuation of the displacement of the supporting plates increased with increasing air flow flux. Vibration cycle of the supporting plates was dependent on the characteristic vibration of the plate. Variation intensity and displacement length of the supporting plates increased with increasing air flux rate, and were found to be dependent on the thickness of the supporting plates. Vibration pattern of the membrane sheet was found to show irregular vibration patterns.

A21 A system to cultivate rice for animal feed with circulated irrigation of treated municipal wastewater

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We proposed a system to cultivate rice for animal feed with circulated irrigation of treated municipal wastewater, aiming at resource circulation among agriculture, livestock farming and urban area. The feasibility of the proposed system was evaluated through the experiment using the simulated paddy field. As the result, the system achieved removal of more than 3 times larger amount of nitrogen from treated wastewater than the similar system cultivating rice for food, which we previously proposed. About 40 % of the removed nitrogen was absorbed by rice plants and this was common to the system without circulated irrigation. On the other hand, circulated irrigation clearly increased the amount of nitrogen released to the atmosphere. Although the yield and quality of cultivated rice were not significantly improved by circulated irrigation, the result of this experiment demonstrated the potential to improve them by adding more treated wastewater in the latter half of cultivation period for earing and bearing.

A22 EVALUATION OF ORGANIC MATTER UTILIZED FOR MICROBIAL REGROWTH IN RECLAIMED WATER USING ORBITRAP MASS SPECTROMETER

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Biodegradable organic matter in reclaimed water was evaluated to find strategy to control microbial regrowth. Assimilable organic carbon (AOC) was removed by activated carbon treatment, produced by ozonation, and stable in the other treatment processes. Higher AOC concentration was liable to cause microbial regrowth, and thus the regrowth can be controlled by reducing AOC concentration. Orbitrap mass spectrometer could successfully determine low molecular weight organic matters consumed by microbial regrowth by analyzing samples before and after the regrowth. The fate in the treatment processes was different among the compounds; they were either produced or removed by ozonation, or stable throughout the treatment.

A23 A study on modeling of Cs and Sr vertical transfer in forest soil

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Radioactive Cs and Sr 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 soils based on the results of field and laboratory experiments on Cs and Sr soil distribution and elution from soil. We assume that Cs and Sr vertically transferred in forest soils depending on mechanical behavior of porewater in forest soils. The calculated values are compared with the measured data . It was found that the calculated values agree in general with the observed data.

A24 Elution Characteristics of Cs and Sr in Heat-treated Soil

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After the accident of Fukushima Daiichi nuclear power plant, decontamination work has been carried out. Soil containing radioactive materials such as Cs is present in the decontamination waste. It is necessary to understand the behavior of radioactive substances in case of the incineration of waste. Therefore, in this study, the dissolution test was carried out using heat-treated soils containing Cs and Sr. The result showed that the elution rate of Cs decreased with increasing heat treatment temperature, and that there was almost no difference between the number of wet/dry cycles. It is considered that Cs was fixed in the soil by the heat treatment. The second result was that the elution rate of Sr increased with increasing the heat treatment temperature, and that this rate after 2- wet/dry cycles was lower than after 1-wet/dry cycle. It is highly possible that less Cs in the decontamination waste containing soil is eluted in the environment because of the fixation of Cs in soil by the heat treatment.

A25 Relationships between physical forms of cesium or strontium and their behavior in a sewage treatment system

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The nuclear accident at Fukushima Daiichi Nuclear Power Plant resulted in the release of radionuclides to the environment. Accident-derived radionuclides have been detected in sewage sludge produced in northern east of Japan. We observed the fate of stable Cs and Sr in sewage treatment process in order to know a fate of radionuclide such as ^{134}Cs, ^{137}Cs, and ^{90}Sr in the process. For both of Cs and Sr, their transfer ratios to primary sludge from the influent sewage were similar levels of the ratios to excess activated sludge to the influent sewage. Transfer ratios to dewatered sludge from influent were 20% for Cs and 9.1% for Sr, respectively. Additionally, it was suggested that particulate Cs and Sr which were sorbed by mineral solids could be transferred to the primary sludge in the primary settling tank, then in the following treatment system; aeration tank, Sr sorbed by organic materials such as activated sludge could be transferred to the excessive sludge.

A26 EFFECT OF pH AND TEMPERATURE ON LEACHING OF CESIUM FROM MUNICIPAL SOLID WASTE BOTTOM ASH

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In order to clarify the leachability of cesium from bottom ash of municipal solid waste, sequential extraction, pH dependence test, and temperature dependence test were conducted. Bottom ash was obtained by incinerating RDF or wood chips to which stable cesium solution was added. It was found that the cesium fraction distribution pattern of bottom ash from wood chips except water soluble fraction was similar to that of actual bottom ash. Less than a pH of 5, cesium leaching ratio was largely increased with decrease in pH. Over a pH of 5, cesium leaching ratio was almost same as that at natural pH. Increase of cesium leaching ratio at 60℃ was 1.2 times higher than that at 20℃ in average. Therefore, the effect of pH and temperature on cesium leaching would be negligible in actual landfill conditions. Cesium in residual state would be present with aluminum and iron that were insoluble in reduction condition.

A27 Actual Situation of Concentration and Inventory of Radioactive Cesium in Matsukawaura Lagoon sediment, Fukushima Prefecture

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In order to qualitatively evaluate the current status of inventory of radioactive cesium in Matsukawaura Lagoon, profiles of radioactive cesium concentration in sediment cores and sediment characteristics were measured at 36 points. It was shown that sediment characteristics were different even at high concentration of radioactive cesium to the same extent. As a result, the inventory of radioactive cesium were also different. Even at high concentration of radioactive cesium, inventory in southwestern high mud content rate was less than the western. The total inventory of down to 20 cm of sediment throughout Matsukawaura Lagoon was estimated to be about 220 GBq, that more than 80% distributed to 15 cm shallower than has been revealed.

A28 Achievement and Maintenance of Partial Nitritation by Controlling DO concentration

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The anaerobic ammonium oxidization (ANAMMOX) process has been attracted in nitrogen-rich rejected water treatment as a novel energy-saving technology. In order to well promote the application of ANAMMOX, the achievement and maintenance of about 57% of partial nitritation was investigated in this research. DO concentration was adjusted and altered by aeration rate, which was the main operational strategy in this study. The CSTR reactor was used and the temperature was set as about 25℃ in this experiment. The concentration of NH4+-N in synthetic wastewater was 250mg/L, with the NLR as 0.5kgN/m3・d. The results showed that when the concentration of DO was set as 0.12mg/L, which led to the inhibition of the activity of NOB, optimal partial nitritation was achieved and maintained for about 50 days. The concentrations of FA and FNA at that condition were 11.4mg/L,0.009mg/L, respectively. Hereby, The conclusion can be deduced that DO was a feasible and crucial parameter in the control of partial nitration in view of the association effects of FA and FNA concentrations caused by DO fluctuation.

A29 CHARACTERISTICS OF EMISSION OF NITROUS OXIDE BY PARTIAL NITRIFICATION-ANAMMOX PROCESS

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Energy saving wastewater treatment system has attracted a lot of attention, and partial nitrification- ANAMMOX process has gained notice for its resource and energy saving efficiency from the point of prevention of global warming. In this study, emission characteristics of nitrous oxide (N_2O) from both partial nitrification and ANAMMOX process were investigated due to its high greenhouse effect. In addition, microbial communities were analyzed by a next-generation sequencer to comprehend their changes during the reactor operation. As a result, the emission of N_2O was detected from both of partial nitrification and ANAMMOX process. In the nitrifying reactor, N_2O generation was observed during ammonia oxidization, and there was a high relationship between their reaction rates. In ANAMMOX reactor, which consisted of 4 tanks, N_2O was produced mainly in the first tank, however N_2O was consumed in the latter tanks after stable biological reaction in the reactor. It is estimated that partial nitrification- ANAMMOX process can generate N_2O in both reaction stage, therefore, countermeasures such as enhancing N_2O consumption in ANAMMOX process will be required.

A30 METABOLIC ACTIVITY OF MARINE ANAMMOX BACTERIA USING HEAVY METALS AND SULFATE

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Ammonium and nitrite that are substrates for anammox bacteria are present at low concentrations in marine sediments. It is hypothesized that marine anammox bacteria survive by obtaining energy from not only ammonium and nitrite but also other substrates such as heavy metals. In the present study, the possibility of metabolic pathways of marine anammox bacteria regarding to heavy metals (manganese and iron), sulfate, and formate were investigated using batch experiments. The manganese reduction rate, manganese oxidation rate, iron reduction rate, and sulfate reduction rate of "*Candidatus* Scalindua sp." were 0.16, 0.005, 0.01, 2.05 nmol mg-protein^{-1} min^{-1}, respectively, which indicated that marine anammox might utilize these compounds as electron donor or acceptor. The fraction of sulfite production was approximately 60% of the sulfate reduction, which indicated the production of hydrogen sulfide and iron sulfide.

A31 EFFECTS OF SRT CONTROL ON MICROBIAL COMMUNITY AND EFFULUENT QUALITY IN REACTOR FOR PARTIAL NITRIFICATION

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Energy and resource-saving technologies for wastewater treatment have been required. A partial nitrification-ANAMMOX process is one of the efficient processes for the nitrogen removal, however, promising operational methods for partial nitrification is required for stable and effective denitrification by ANAMMOX. The objective of this study is to comprehend effects of SRT on water quality and microbial community in reactors for partial nitrification. It was achieved that nitrite accumulated over 50% of total nitrogen for 15 days in a reactor with SRT of 3.4 days but not achieved with other SRT conditions. Therefore, it was shown that a SRT control can be useful for the partial nitrification. It was likely that amounts of AOB and NOB affect the partial nitrification because the transition of their amount changed when nitrite started to accumulate. When nitrate concentrations started to increase, changes in bacterial mass of AOB and NOB were observed. It was also cleared that the differences of SRT affected microbial community in each reactor, and comparable results of microbial community formation were obtained when the SRT condition is similar, which suggests operation by SRT can control microbial community formation in nitrifying reactor.

A32 4 Years of Phosphorus Removal Performance in a Multi-stage Constructed Wetland Using Autoclaved Lightweight Aerated Concrete

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Based on 4 years of performance of phosphorus removal in a multi-stage constructed wetland with au-toclaved lightweight aerated concrete (ALC) treating milking parlor wastewater, potential of constructed wetland as an advanced treatment and effect of vegetation on sustainability of phosphorus removal were evaluated. Although a higher phosphorus removal was observed in growing period compared to dry-up period for the first 2 years, such tendency was reversed from the third year. The phosphorus removed per unit area was higher at upper treatment stages. Transition of phosphorus load to down treatment stages with the years, however, equalized phosphorus removal performance per unit area at each treatment stage. The difference in treatment performances between planted and unplanted wetland suggested that vegetation had a delay effect on saturation of phosphorus sorption by ALC and on transition of phosphorus load to down treatment stages, resulting in endurance of high phosphorus removal performance for 4 years. Advanced treatment of phosphorus was possible by constructed wetland without a plant harvesting process. Annual phosphorus removal efficiency for 4 years treatment reached 87.6% under planted condition.

A33 THE EFFECTS OF OPERATION FACTORS ON MgKPO4 CRYSTALS

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The objective of this study is to selectively recover potassium magnesium phosphate (MgKPO4/MPP) of a large shape from wastewater containing phosphorus and potassium. Magnesium chloride as precipitation reagent was added to the synthetic wastewater including phosphate and potassium ion. Changing the addition rate and stirring rate induced the selective crystallization of MPP of large shape, indicating that MPP of high purity of large shape improve the performance of quality control and solid-liquid separation. The obtained white precipitate was needle-like crystals of typical potassium magnesium phosphate. Changing standing time and addition time induced ratio of MPP and Mg3 (PO4)2. Changing stirring speed, length of the crystal was changed. The production of magnesium potassium phosphate was confirmed by Energy dispersive X-ray spectrometry. Setting short standing time, longer addition time, slower stirring rate and lower Mg concentration to be added, selective crystallization MPP of large shape can be recovered.

A34 An estimation of Disability adjusted life years associated with indirect potable reuse based on the occurrence of *Campylobacter jejuni*

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Health effects of *Campylobacter jejuni* associated with the consumption of reclaimed water by soil aquifer treatment (SAT) were estimated based on Disability adjusted life years (DALYs) approach as a risk indicator. For this purpose, *C. jejuni* concentration in treated wastewater and the removal and inactivation efficiency of the bacteria by SAT (Hydraulic retention time (HRT) of 10 days) were measured. *C. jejuni* concentration in treated wastewater ranged from 9.2 to 1.2×10^4 MPN/L. The removal and inactivation efficiency of fecal coliform as a surrogate for *C. jejuni* was estimated to be in the range of 5.06 and 6.81 $\log_{10}$. These results showed that SAT was effective for the removal and inactivation of bacteria. Also, *C. jejuni* strains in wastewater, which were associated with Guillain-Barré syndrome (GBS), were identified by polymerase chain reaction (PCR). Our result showed that health effects of GBS were very important for estimating DALYs. The application of these obtained results to the caluculating of the DALYs enabled the estimation of actual health effects of *C. jejuni* with indirect potable reuse. Mean value of the DALYs associated with *C. jejuni* by direct potable use of SAT effluent was estimated to be 3.96×10^{-4} DALYs person^{-1} year^{-1}.

A35 DEVELOPMENT OF TRANSMISSION MODEL FOR NOROVIRUS GASTROENTELITIS CONSIDERING SECONDARY INFECTION IN HOUSEHOLD

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To predict transmission pattern of Norovirus gastroenteritis at regional scale, we've constructed an infectious disease transmission model that considers secondary infection in households. In the model, a household-scale sub-model that could simulate secondary infection within family members was independently and in parallel applied to all households in the modeled region. The result of simulation showed that the effect of the secondary infection on the spread of the Norovirus gastroenteritis was larger than the primary infection. In particular, households of more than four family members including infant(s) showed ten times higher infectious risk of the secondary infection. Based on comparisons with empirical epidemiological data in the modeled region, our approach demonstrated a high utility of the model in estimating the exposure time from the primary infection time.

A36 Exhaustive genetic analysis for *Norovirus* GII accumulated in cultured oystes by using pyrosequencing

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Genotypes of *Norovirus* (NoV) genogroup II accumulated in cultured oysters were identified by using pyrosequensing. Application of pyrosequencing, instead of direct or cloning sequencing methods, could detect relatively minor genotypes, which existed at an ratio of several percentage per oyster. GII.4 Sydney 2012 variant was detected at quite high ratio of 85-100% from all oyster samples tested and GII.6 was detected at 10% and 15% from some samples. Comparing with epidemic situation, it was indicated that dominant NoV genotypes/variants in oysters were derived from patients in the watershed after last January.

A37 Effects of Coagulation Conditions and Water Qualities of Secondary Effulents on The Removal of Virus by Coagulation Treatment Prior to Membrane Filtration

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In this study, reduction efficiencies of viruses in secondary treated waters by coagulation treatment and following membrane filtration, which are supposed to be treatments for wastewater reclamation, were studied. The coagulation followed by UF filtration showed only a 3-log reduction in the pilot plant test. Consequently, lab-scale tests for evaluating effects of coagulation condition, i.e., types and dosages of coagulants, and raw water quality, i.e., SS, pH, DOC, E260, were conducted.Regarding raw water quality parameters, pH and DOC showed a great effect on virus reduction by coagulation and following membrane filtration (0.45μm) while particles larger than 0.01 μm were not seemed to affect that. It was found that the pH5 condition was optimization of viral adsorption to/entrapment in floc. As the result, we could achieved 7-log virus reduction by coagulation under pH5 following by membrane filtration.

A38 Inactivation of *Enterococcus* in Compost-Amended Soils

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The application of improperly treated compost is one of the causes of bacterial contamination in the field, crops, food and water. Although there are practical guidelines for treatment of compost published, there could be a misapplication in local situations, such as lack of attention by traditional users, labour ineffectiveness and material unavailability. Considering these setbacks, farmers may unknowingly use improperly treated compost as fertilizer. The objectives of this study were (i) to characterize the die-off represented by kinetic inactivation rate coefficient, k (h^{-1}) of *Enterococcus* in clay and sandy loam soils, (ii) to determine the effect of temperature, compost-to-soil ratio and soil type on the inactivation rates of *Enterococcus*. The soils were amended with compost at a ratio of 1 part compost to 10 parts of soil (1:10), 1:25, 1:50 and 1:100 held at different temperatures (30°C, 40°C and 50°C). The moisture content was set to 25% in all conditions. *Enterococcus* is enteric bacteria and not always pathogenic but an indicator of pathogenic bacteria. Inactivation of *Enterococcus* (pathogenic bacteria) in the soil with high temperature under different compost application rates was tried in the laboratory test. As a result, (1) the inactivation rates of *Enterococcus* in clay soils were 0.015 - 0.027 h^{-1} , 0.246 - 0.322 h^{-1}, 0.397 - 0.571 h^{-1} for 30, 40 and 50°C respectively. Sandy loam soils were 0.056 - 0.130 h^{-1}, 0.348 - 0.447 h^{-1} and 0.475 - 0.630 h^{-1} for 30, 40 and 50°C respectively, (2) inactivation rates of *Enterococcus* in soils amended with compost from the composting toilet depended on temperature and soil type but not on the compost-to-soil ratios. The experimental conditions in this study are different from the real field situation because temperature and humidity changes over time under field conditions. Therefore, care must be taken when interpreting the results of this study to estimate the die-off rates in real field conditions. Further research is required to simulate the behaviour of pathogenic bacteria in field conditions of a hot semi-arid climate.

A39 SEASONAL CHARACTERISTICS OF FECAL INDICATORS IN WATER ENVIRONMENT RECEIVING EFFLUENTS OF DECENTRALIZED WASTEWATER TREATMENT FACILITIES

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Decentralized domestic wastewater treatment systems are generally used in rural areas for preventing pollution of local water environment. Treated waters of decentralized systems potentially contain fecal contaminants and the degree of contamination can vary seasonally. To identify the seasonal characteristics of fecal indicators in the area of decentralized system, seasonal monitoring on the characteristics of fecal indicators (total coliforms, *Escherichia coli*, and F-specific coliphages) was performed along an open channel receiving *johkasou* effluents over 3-year period. Fecal indicators were detected higher than environmental quality standard throughout the season, particularly for total coliforms, and the concentrations of *Escherichia coli* downstream seemed to be higher than upstream in winter. The low water quality was recorded during cold-low flow season and the effluent of *johkasou* was an important factor reflecting water environment quality. In contrast with most physicochemical parameters, significant seasonal differences of total coliforms and *Escherichia coli* were not observed both in water and sediment. The principal component analysis results show that four dominant factors related to chemical contaminants, environmental conditions, byproducts, and fecal contaminants were responsible for the water quality data structure and significant seasonal differences were observed for chemical contaminants, environmental conditions, and byproducts, accounting for 59 % of the total variance in the data set. Seasonal maintenance of discharged water quality and controlling downstream network capacities are necessary to reduce the potential impact of *johkasou* effluents into local water environment.

A40 SPATICAL AND TEMPORAL CHANGES OF SUSPENDED SOLIDS AT NORTHEN WATER AREA IN ISAHAYA FLOOD REGULATION POND

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Suspended solids (SS) absorb the organic or nutrimental materials on their surfaces. Thus, it is very important for the adequate water quality management to make clear the temporal and spatial changes of SS in water area. In this study, field observations were continually carried out in Isahaya flood regulation pond to grasp the short- term variation of SS. The measured results show that SS distribute almost uni-formly in vertical direction at surface and middle layers. Their concentrations vary with the wind condi-tion blowing over the water surface. On the other hands, high concentration conditions are kept in night wind becomes almost calm. Next, a numerical simulation model was developed and applied to this pond. From the computed results, it is shown that SS distribute with being affected by water flows induced by wind. And the concentration of SS rises at upwind area, because the deeper waters contain high concen-tration of SS were carried up near water surface by the formation of upwelling flow.

A41 LONG-TERM CHANGE OF DISSOLVED OXYGEN IN THE ARIAKE SEA

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Dissolved oxygen (DO) mainly declines in the inner part of the Ariake Sea during summer. Low DO is frequently observed in a short period and in the small area together with red tides and/or density stratifica-tion. Since many researches on the decrease in DO in the Ariake Sea were conducted only in the limited period and area, the study on the change of DO in long-term and over the wide area becomes necessary. In this study, a finite volume model is applied as an analysis tool to determine phenomena of the long-term change of DO in the Ariake Sea. The simulated results reveal that the level of DO in the summer of the 1970s is lower than that in the recent decade. It is pointed out that algal production due to the disposal of human excrement in the Ariake Sea is the major cause of low DO in the 1970s.

A42

A43 A relational assessment between water experiences and urban river consciousness by association analysis

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Relationships between one's history of waterfront experiences and his/her consciousness of urban rivers are statistically analyzed by association analysis on the basis of Personal Construct Theory. The results show over 80% of people who have had deep river experiences in their daily lives have higher positive consciousness of neighborhood rivers, and over 65% of people who have had been controlled waterfront activities in their youth days and have had a feeling that neighborhood rivers are polluted have negative consciousness. Those indicate that glowing positive consciousness of neighborhood rivers require frequent waterfront experiences, and parents or teachers' considerations of children's waterfront activities would help to decline their negative consciousness of neighborhood rivers.

A44 Novel Exposure Assessment Method Using Chamber for Spray Products Containing Nano-Titanium Dioxide

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The purpose of this study is measuring the amount of the nanoparticle generated from the product including nanomaterial in the popular use situation.
The evaluation approach was used Chamber method to replicate real situation, and electrostatic col-lector to analyze and observe the produced nanoparticles. In chamber method, air ventilation of HEPA filter could suppress background value, so agglutination of particles were not confirmed. In electrostatic collector, trapping efficiency was 78% under applied voltage 2000 V.
By using this method, we tried exposure assessment of antibacterial spray. Therefore, the lung deposi-tion amount when the spray using was 1.29×10-5 mg/kg/day.

A45 Study on Heatstroke Risk Indexes Using Daily Fluctuation Patterns of Surface Wind Directions

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The WBGT index is commonly used to indicate heatstroke disease risk but the index does not always expect the risk in night time correctly. The puopose of the present study is to examine whether daily fluctuation patterns of surface wind directions can be a indicator which appropriately expresses the night time risk. It is shown that fluctuation characteristics of the WBGT vary by the daily fluctuation patterns. A new index Y(T) which is calculated by time integrations of the WBGT and can take past records of sultry environments into consideration is proposed and it is also shown that fluctuation characteristics of Y(T) differ by the patterns. It is indicated that night time averages of Y(T) for each pattern correlate closely with nocturnal heatstroke desease risks and the pattern W which means that west wind blows all day long has the highest risk for nocturnal heatstrokes. From the above results, we concluded the daily fluctuation patterns of surface wind directions can be utilized as a indicator to expect heatstroke disease risks in the night time.

A46 Development of Food Web Model Including Microbial loop and Impact on Food web dynamics by Bacteria

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The food web model of water mass is urged to be able to express change of the food web dynamic which changes with trophic levels. Moreover, it is thought that bacteria which are main decomposer affect the whole food web in respect of nutrient reproduction.The purpose of this study is to construct a Food web model based on verification by an observation phenomenon and to show the influence which bacteria have on a food web dynamic using a model.
It was shown that the built model can reproduce the biomass and its composition, energy flux and phosphorus regeneration by the different trophic level. Bacteria changed phosphorus regeneration and affected the Total biomass. Moreover, the microbial food chain which makes bacteria a starting point played the important role in the field of the predation pressure to a primary producer, and the energy transfer to a higher level predator, and has contributed to suitable modeling of a food web dynamic state. It was shown that the impact which makes bacteria a starting point is what affects the whole food web.

A47 Effects of Subsidence and Tsunami on Vegetation and Botanical Variety in the Kitakami River Mouth by the 2011 Earthquake off the Pacific Coast of Tōhoku

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Reed communities in the kitakami river mouth were changed by the 2011 earthquake off the pacific coast of Tōhoku. GPS vegetation survey, aerial photo image analysis, cross-section surveying data analysis, and so on were carried out in September 2012, 2013 in order to examine decay factors and recovery factors. Main findings are as follows : 1) Total area of reed communities between river mouth and 9.0 km from the river mouth were 102.3 ha (left bank 66.4 ha, central shoal 21.0 ha, right bank 14.1 ha) in September 2008, however they decreaed to 33.6 ha (left bank 27.8 ha, central shoal 4.7 ha, right bank 1.1 ha) in July 2012 due to the 2011 earthquake. 2) Most reed communities disappeared on the ground lower than T.P.-60 cm. 3) Total area of reed communites in October 2013 recovered from 33.6 ha (one and a half years after the earthquake) to 36.6 ha (two and a half years after the earthquake). Especially, it was occurred on the ground higher than T.P.16 cm. 4) Total 111 plant species were observed in the reed communities. Many alien plant species were observed at the survey lines 9.0 km and 14.2 km.

A48

A49 EVALUATION OF FISH MIGRATION SUCCESS THROUGH FUSHINO RIVER STONES EMBEDDED FISHWAY BASED ON PREFERENCE

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Stones embedded fishway in Fushino river is highly appreciated as an good example of inexpensive small scale restoration works. However, its efficiency on fish migration and/or designing parameters of the same type of fishway are not clear enough. To examine the migration efficiency of the fishway, we released Ayu (Plecoglossus Altivelis Altivelis) in the fishway and measured migration success rate. We also built an fishway evaluation procedure based on fish preference on velocity and air bubble. The evaluation procedure could successfully explain 30 min migration success rate. To improve migration success rate in a fishway which has multiple migration paths, not only preparing highly preferred migration paths, but also removing less preferred migration paths would be important.

A50 High-solids anaerobic co-digestion of seven kinds of waste biomass mainly consisting of dewatered sludge produced in an oxidation-ditch process and waste fried Tofu

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To achieve concentrated treatment of several organic wastes and promote the recycle of waste biomass in local towns, a high concentrated continuous co-digestion experiment was conducted in a 1m3 of mesophilic digester. The waste biomass mixture of which TS was approximately 8.8% consisted of waste sludge from an oxidation ditch process (OD), a contact aeration process and a septic tank, human waste, kitchen garbage and two kinds of fried tofu (raw type and dry type). With an average organic loading rate of 2.5kg-VS/m3/d, digestion operated stably. Biogas yield of waste mixture was 0.29 Nm3/kg-VS, and average VS removal ratio was 37%. No significant difference was shown of the dewatering characteristics of digested sludge, compared to the input OD sludge. Fertilizer effect analysis shows that digested sludge quality met the Fertilizer Control Act,, and high fertilizer efficicency was suggested. .

A51 Effects of Total Solids Concentration on Mesophilic Anaerobic Digestion of Dewatered Municipal Sewage Sludge

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Co-digestion of sewage sludge and regional organic waste, such as kitchen garbage, is a promising energy recovery method for small facilities. Dewatered sludge is effective for transporting sewage sludge to a centralized wastewater treatment plant. Effects of substrate concentration on mesophilic anaerobic digestion performance and characteristics of digested sludge were investigated by a continuously operated experiment fed with dewatered sludge of approximately 20 (undiluted) － 5% total solids (TS). Substrate concentration less than 10% TS resulted in stable operation with methane production of 0.47 NL/gVS, viscosity less than 5 dPa·s, and ammonia concentration less than 3,000 mgN/L. Substrate concentration greater than 15% TS resulted in digested sludge of more than 10% TS and unstable performance with accumulation of volatile fatty acids.

A52 Anaerobic Co-digestion Characteristic of Sewage Sludge and Rice Straw by Pilot-scale Experiment

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Anaerobic co-digestion of sewage sludge and currently unused biomass has been paid attention. In this study, we focused on the utilization of rice straw. We conducted continuous experiments using pilot-scale digesters at a sewage treatment plant for establishment of practical application of the co-digestion technology.Rice straw was ground to about 2-3 mm in length, and then pretreated by soaking with water or enzyme-water. Two digesters were fed sewage sludge with (1) water soaked rice straw, (2) enzyme-water soaked rice straw. A digester fed sewage sludge alone was operated as a control.The digesters were operated under the condition that the mixture ratio of sewage sludge and rice straw were 1:0.5 and 1:0.75 based on TS. When the mixture ratio was 1:0.5, the operation was satisfactory and the specific biogas production (SBP) of rice straw was as high as 342-377 NL/kg-VS. The SBP dropped to 218-242 NL/kg -VS in the mixture ratio of 1:0.75. In both cases, higher SBP was obtained by using enzyme pretreatment.

A53 Differences of performance by different temperatures as first stage of temperature phased anaerobic digestion

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In order to investigate the operating differences by different temperatures as first stage in a temperature phased anaerobic digestion (TPAD), continuous experiments were conducted combining a thermophilic(55 ℃) first stage and a mesophilic(35 ℃) second stage, named TM-TPAD, and then combining a hyper-thermophilic(70 ℃) first stage and a mesophilic(35 ℃) second stage, named HM-TPAD, focusing on the long-term performance, organic degradation and particle hydrolyzation. The experiments of a single mesophilic(35 ℃) anaerobic digestion (MAD) were also carried out as comparisons. In this study, the HM-TPAD was operated stably in the long run, achieving a volatile solids (VS) destruction of 51.8%, which was 1.39-folds and 1.16-folds of the values of TM-TPAD and MAD respectively. It can also be concluded that the higher temperature is set to the first stage, the more efficient organic degradation and particle hydrolyzation is obtained for WAS digestion.

A54

A55 Characterization of Grate Sifting Deposition Ash, Unquenched Bottom Ash and Water-Quenched Bottom Ash from Mass-Burn Moving Grate Waste to Energy Plant

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This study investigates grate sifting deposition ash, unquenched bottom ash, and water-quenched bottom ash from a mass burn waste-to-energy plant. Various methods were used to determine the characteristics of these ash types and to evaluate the influence of water quenching on bottom ash characteristics, namely visual observation, analysis of particle size distribution, particle thin section analysis, measurement of pH, moisture content, and loss on ignition, bulk chemical analysis, and mineral composition analysis. Results showed that the pH of all samples was in the range of 11.7–12.7. Approximately 70–80 % of samples consisted of CaO, SiO_2, Al_2O_3, and Fe_2O_3. All samples were also enriched with Zn, Cu, Ba, Pb, and Cr, with concentrations higher than 500 mg/kg. Major minerals found in all samples included calcite, quartz, gehlenite, hematite and mayenite. However, physical, chemical, and mineral characteristics of the samples were heterogeneous. There were various indicators of the influence of water quenching on bottom ash characteristics, including differences in particle size distribution, the existence of an unidentified outer layer in water-quenched bottom ash, the decrease in pH, concentrations of CaO, Al_2O_3, Fe_2O_3, Cl, Cu, Ba Pb,Sr and As, and the presence of Friedel's salt in water-quenched bottom ash. Further research on the transformation of bottom ash during the quenching process is needed, as also further study of the mechanisms and functions of the unidentified outer layer.

A56 Behavior of gas and heat transport in a simulated temporary disaster waste pile

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The most severe disasters generate debris and waste in quantities that can overwhelm existing solid waste management facilities, therefore it is stored in the temporary disaster waste pile for further reuse and recycling. Since waste is highly heterogeneous, it is separated into different material and let under meteorological conditions. Due to high moisture content and anaerobic condition inside pile, wood particles deteriorate quality and along with organic matter even initiate spontaneous fire. Better understanding of gas behavior inside a disaster waste pile could lead to improve storage method and preserve waste quality and energy respectively. Furthermore, avoiding spontaneous fire would benefit safe storage without additional costs. The objective of this paper is to determine the variation of gas component and temperature in a simulated temporary disaster waste pile in order to enhance methods and condition of a storage site. A Column experiment was used to simulate waste pile under different physical conditions. Gas chromatography was utilized to investigate diffusion behavior of disaster waste pile. Temperature was continuously measured in various waste profiles and the influence on waste storage was examined. Based on disaster waste characteristics, waste material was analyzed under various moisture condition and density. In order to calculate the diffusion coefficient, it was assumed that the gas concentration curve of the diffusion, is obtained as a sum of the contributions of the corresponding single components under different density and moisture content. The paper demonstrates that the density level and waste characteristic could provide an indication of the gas behavior in waste pile. Results show that diffusion characteristics are varied with solid waste dry density and composition.

A57 Evaluation of Greenhouse Gas Emission, Nitrogen Load and Break-Even Point of introducing Lactate Fermentation and Catch Crop System

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In previous studies, a system consisting of catch crop cultivation and lactate fermentation was proposed in order to reduce greenhouse gas emission and nitrate infiltration from agricultural field. The system also has aims of recovering nutrient and producing lactate from catch crops to gain profitable products. In this research evaluation of the amount of greenhouse gas emission, nitrogen load to water environment and break-even point of introducing the lactate fermentation system of catch crop were conducted. As a result, increased amount of greenhouse gas emission from the whole system is larger than the decreased amount of N2O gas emission from agricultural field by catch crop. Most of the nitrogen load from agricultural fields cleaned up by catch crop is discharged as waste water from lactate production process. This means non-point source pollution in the agricultural fields is transformed to point source pollution through the system. Evaluation results showed the system could help to reduce the nitrogen load on water environment using advanced wastewater treatment. From the evaluation of the production cost, we found that nutrients extracting system in the previous stage of lactate fermentation is relatively advantageous than other systems. It was found that the break-even point of the system is greater than 105tDryWeight of catch crop, which means it is greater than 18ha of cultivation area of catch crop.

A58 CULTIVATION OF OIL-PRODUCING ALGAE USING AN ANEAROBIC DIGESTION EFFLUENT CONTAINING A HIGH CONCENTRATION OF AMMONIUM-NITROGEN

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This study was carried out to search for algal strains that grow at a wide range of salinity and has tolerance against ammonium nitrogen and to investigate an anaerobic digestion effluent as a medium for algal culturing. The 5 algal strains of blue-green (strain A), green (strains B, C, D), and diatom (strain E) were examined for salinity tolerance, and the results showed that at a range from 0.2‰ to 30.6‰ salinity did not affect the maximum growth and lipid productivity of strain A. The strain A was *Synecococcus* sp., and among the 5 strains the specific growth rate of strain A was the highest. Further ammonium tolerance tests were carried out using the modified f/2 medium containing NH_4Cl as the nitrogen source. The strain A grew at a range from 0.9 mM to 57.6 mM of ammonium nitrogen concentration, and its maximum growth attained to be highest at 14.4 mM. Although the maximum growth of strain A at this concentration was higher than that cultured in the normal f/2 medium, nitrate nitrogen was preferable for the strain A than ammonium nitrogen. The strain A grew and produced lipid in the anaerobic digestion effluent diluted with the secondarily treated sewage or seawater; however the anaerobic digestion effluent had the growth suppression factors against the strain A. As a dilution media for the anaerobic digestion effluent, the secondarily treated sewage was better, because it gave more maximum growth and lipid production of strain A.

A59 Development of high-speed manufacturing systems for domestic water from groundwater containing high concentrations of iron and manganese

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In order to keep the water supply stable in disaster conditions such as the Great East Japan Earthquake, the objective of the present study was to establish a manufacturing technology for high-speed processing of groundwater for domestic use in the case of disaster. It was possible by high-speed water flow experiments using weak acid ion-exchange resin, to maintain the treated water pH level and sufficient iron-manganese removal capability for a long period of time. Based on these results, continuous water flow experiments using a combination of weak acid ion-exchange resin and UF membrane were conducted with two space velocity (SV) conditions.; medium-SV of 100[1/hr] and high-SV of 200[1/hr]. As a result, although the total filtration water volume was lower than the target volume by 17% in the medium-SV conditions, an acceptable water quality level was obtained in the resin alone and a satisfactory quality was continuously achieved in the membrane permeate. In the high-SV conditions, total filtration water volume was lower than the target by 34%, but an acceptable water quality was continuously achieved in the membrane permeate.

A60 ASSESSMENT OF HEAVY METAL CONTAMINATION OF COASTAL SEDIMENTS IN TUVALU AND INVESTIGATION OF THEIR REMOVAL METHOD USING AN EXISTING SEPTIC TANK SYSTEM

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To evaluate the contamination of coastal sediments along the Fongafale Islet, Tuvalu, Central Pacific, a field survey was conducted along the lagoon-side coast, near a densely populated area. Gray and white layers were obtained in the sediment core samples, whereas relatively high acid-volatile sulfide was detected in the gray layer. Considering that the leakage of domestic wastewater from poorly constructed sanitary facilities seeps into the coastal lagoon through groundwater during ebb tides, the gray layer was considered to be the runoff pathway of the leaked domestic wastewater. Sediment contamination indices were applied to estimate the contamination level of the sediments. The result shows that heavy metal pollution exists in both colored sediment samples. Then, assuming that an existing septic tank system is used, heavy metal removal method was investigated by operating a 6-L-scale sequencing batch reactor with domestic wastewater as the feed. By this treatment, over 68% removal rate of Pb, Zn, and Cu was achieved, largely owing to the formation of metal-sulfide.

A61 Removal of Fluoride from Wastewater of Hot Spring by Hydroxyapatite Synthesized from Gypsum Waste and Its Optimum Treatment

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This study evaluated a hydroxyapatite synthesized from waste materials to remove fluoride from wastewater of Gero hot spring containing chloride ion with high level. In addition, this study investigated the mechanisms of fluoride removal by the apatite, the suitable condition of removal treatment, and the capability of reuse of apatite. The apatite could remove fluoride from the wastewater of hot spring below the Environmental Quality Standards for Water Pollution in Japan. The capacity of fluoride removal by apatite was higher than those previously reported. Fluoride sorbed on the apatite was chemically stable within pHs of 2 to 8, and 80% of fluoride removed by apatite was attributed to the precipitation of fluorapatite. The optimum treatment conditions of fluoride removal were the addition ratio of 2 g/L and the treatment time of 5 min. However, the reuse of apatite could not result in the fluoride removal below the standard.

A62 Chemical Reactions of Fluoride Removal by Chicken Bone Char

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Chicken Bone Char(CBC) work effectively to remove fluoride ion from solution. It has been reported that the ion exchange between fluoride ion and the hydroxide ion is the dominant reaction in fluoride removal. However, the pH value of the solution changes much less than that expected from the ion exchange reaction between fluoride ion and hydroxide ion after CBC removes fluoride. In the current study, chemical reactions involving in fluoride removal by and CBC was investigated according to an ion budget in the solution during the fluoride removal. It was revieled that when NaF solution was used, CBC removed fluoride by ion exchange with phosphate ion, hydroxide ion followed by the reaction with CO2 to produce bicarbonate, and an ion exchange with bicarbonate in CBC. On the other hand, when artificial well water containing calcium and magnesium was used, CBC showed a much higher rate in fluoride removal. The formation of calcium chloride and fluoroapatite seemed to acceralate the fluoride removal from the solution.

A63 Continuous removal of arsenic using a DHS reactor with arsenite-oxidizing bacteria

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The health impairment caused by ingestion of the arsenic in groundwater is serious especially in Asian areas. Ferrous iron (Fe (II)) is detected in groundwater with arsenic. In order to improve the efficiency of coagulation or adsorption process for arsenic removal, arsenite (As (III)) which is a predominant form in groundwater needs to be oxidized to arsenate (As (V)) as a pretreatment. In this research, arsenite-oxidizing bacteria are enriched from activated sludge, then 16S rRNA gene analysis was conducted. Arsenite oxidization characteristics under different culture conditions (DO, pH, and temperature) were examined and the optimum conditions of pH and temperature were 7 and 30℃, respectively. For the purpose of developing an economical arsenic removal method without an aeration equipment, an oxidizer, and a flocculant, a Down-Flow Hanging Sponge (DHS) reactor with fixed arsenite-oxidizing bacteria was examined. As a result, when the inflow concentrations of As (III) and Fe(II) were 0.5 mg/L and 25 mg/L, respectively, the average arsenic removal efficiency was about 95 %. This efficiency was correspondent to the water quality standard for drinking water value of 0.01 mg/L.