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Background

Plastic waste has become a major component of riverine and coastal pollution. Recently, the abundance and effects of small plastics, namely microplastics, raise an increasing concern as several studies have shown the harmful effects of microplastics on organisms upon ingestion. Microplastics can also act as vectors to transfer endocrine-disrupting chemicals and other pollutants from the environment to organisms. Currently, most microplastic studies are concentrated in developed countries such as Europe, North America, and the East Asian region. Few studies on the subject have been carried out in the Southeast Asian region. However, countries in the region are facing significant challenges in plastic waste management. In the top 10 countries that have mismanaged plastic waste, 5 countries belong to ASEAN. Therefore, it is necessary to communicate among researchers to work together with this emerging pollutant, so as to find environmental measurements for the prevention of microplastic pollution and to support sustainable plastic waste management.

This webinar is co-organized by Sirindhorn International Institute of Technology (SIIT), Thammasat University, in celebrating the 30th anniversary of SIIT, Chulalongkorn University, Thailand, and the Institute for Global Environmental Strategies (Japan).

The objectives of this international webinar are:

- To understand sources and measurements for prevention/control of microplastic pollution in the environment.
- Capacity building of researchers working on microplastics.
- To create a research network for microplastic pollution.

Topics

- Monitoring, distribution, sources, and abundance of microplastics.
- Environmental measurements for microplastic pollution.
- Removal technologies for plastics and microplastics from the aquatic environment.
- Microplastic accumulation in biota and impacts.
- Other topics are relevant to microplastic research.

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FATE OF MICROPLASTICS UNDER ENVIRONMENTAL RELEVANT CONDITIONS

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Plastics are in common use of everyday life that has resulted in its production of >320 million metric tons per year, which is expected to double in the next 20 years from the current level. Consumer plastics products contain complex mixtures of starting materials like monomers and oligomers and multiple additive compounds (e.g., phthalates, bisphenol, flame retardants, and antioxidants). Therefore, plastics are not a single compound but a mixture of extractable chemicals, which may be released into water under typical environmental conditions. For example, solar irradiance can cause the degradation of plastics that would release broken monomers and oligomers and organic additives, which could cause potential public health concerns. The release of plastics into the aquatic environment is of global threat because of their fragmentation into microplastics (MPs) and possibly nanoplastics (NPs). The presentation will present our preliminary findings on the exposure of the mixtures of polyethylene terephthalate (PET) MPs and dissolved organic matter (DOM) to simulated sunlight. Afterwards, the samples (solid and solution) from these treatments were analyzed with a range of spectrometric and surface characterizations techniques. The results suggest that the co-presence of DOM and MPs mutually affect the transformation of each other even in the dark. Light irradiation further complicates the interactions of MPs and DOMs by inducing reactive species (RS). In the presentation, changes in both MPs and DOM and possible mechanisms of interactions will be discussed by examining the possible reactive species such as environmental persistence free radicals (EPFRs) and reactive oxygen species (ROS) such as (e.g., $^{3}DOM^{*}$, $^{1}O_2$, $^{\bullet}OH$).

Keywords: Plastics; photochemistry; degradation; reactive oxygen species; natural organic matter

PLANT UPTAKE OF MICRO- AND NANOPLASTICS AND ITS FOOD SAFETY IMPLICATIONS

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Massive production of plastics over the past century has resulted in widespread plastic pollution around the world. These plastic wastes age in natural environments due to a range of mechanical, thermal, chemical and biological factors and break into microplastics (MPs) (<5 mm) and nanoplastics (NPs) (1–1000 nm), which are of particular concern due to their potential negative effect on agroecosystems and threat to food safety. In addition to their direct uptake and accumulation in plant tissues, MPs and NPs can function as a vector for other environmental chemicals, either intentionally added to the matrix of MPs and NPs as additives, or adsorbed on the surface of these plastic particles, altering the fate and uptake of co-existing environmental pollutants in agroecosystems. Preliminary studies in our lab investigated the uptake of polystyrene (PS) NPs (500 nm) and their modification on the uptake of co-existing per- and polyfluoroalkyl substances (PFAS) by lettuce, a common food vegetable. The results suggested that the properties of MPs and NPs, and the coexisting environmental pollutants play a key role in their uptake and accumulation in plant tissues. Our lab has also explored different extraction (e.g. alkaline digestion and acid digestion) and characterization (e.g. microscopic and spectrophotometric) methods of MPs and NPs in plant tissues and detailed results will be presented in the webinar. Overall, our results suggest that prevalent MPs and NPs in the environment can be accumulated in food crops and expose humans to these hazardous materials through food consumption, calling for more detailed characterization of the food safety risks posed by MPs and NPs.

Keywords: Microplastics; nanoplastics; plant uptake; food safety

PHOTOAGING OF MICROPLASTICS BY UV PROCESSES

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Microplastics (MPs) are ubiquitous in the environment and subjected to a variety of natural processes, thus the understanding of their aging behaviors has become a research hotspot. Due to the short period required, aging of MPs induced by advanced oxidation processes (AOPs) are popular currently, among which accelerated photoaging via ultraviolet (UV) exposure is of great significance considering UV is widely applied in water treatment plants. This study provides a comprehensive insight into the analysis on the potential impact to MPs through UV irradiations (UV, UV/H_2O_2) at different wavelengths (275 nm, 310 nm and 365 nm). The physiochemical characteristics (size, color and structure alteration) of aged MPs (polyethylene (PE), polystyrene (PS)) were analyzed via multiple methods including stereo microscope, scanning electron microscope (SEM) and Fourier-transform infrared (FTIR) spectroscopy. Total organic carbon (TOC) and zeta potential of microplastic solution were detected to study the photoaging efficiency. Mechanism exploration including the generation of reactive oxygen species (hydroxyl radicals, OH•) was quantified via chemical probe (p-chlorbenzoic acid). It was revealed that fragmentation and formation of oxygen-containing functional groups occurred to MPs during photoaging. Besides, alteration of TOC and three-dimensional fluorescence spectra using Excitation Emission Matrix-Parallel factor analysis indicated that photoaging promoted the release of leachate or generation of small molecular organics. In addition, it was suggested that the difference in aging degree under UV exposure at different wavelengths was ascribed to the various concentrations of OH•, where H_2O_2 accelerated the oxidation of MPs by facilitating the production of OH•. These results lead to a better understanding of microplastic long-term aging behavior and provide guidance for the application of AOPs to convert MPs into smaller chemicals with lower toxicity and achieve the objective of mitigating microplastic pollution.

Keywords: Microplastics; UV; UV/H_2O_2; Photoaging

THE CONTRIBUTION OF MICROPLASTICS TO CLIMATE CHANGE

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There has been an increasing use of plastic products, which contributes to plastic pollution and climate change potential. Oceans play a critical role in absorbing greenhouse gases generated on earth, yet microplastic pollution negatively influences by hindering the carbon flow in the ocean. Manufacturing plastic products heavily relies on fossil fuels, thereby worsening climate change. Furthermore, greenhouse gases are emitted through the degradation of macro plastics into microplastics. Despite growing threats to the environment by plastic pollution and global warming, how microplastics, particularly the degradation of plastics, influences climate change has been overlooked. Increasing temperature from global warming could be one of the factors to consider for the ecological risk assessment of microplastics. In this seminar, the life cycle stages of plastics (from raw materials, manufacturing, transportation, consumer goods, and disposal) are reviewed and the critical concentration for microplastics to impact climate change is discussed.

Acknowledgement: This work was supported by Korea Environment Industry & Technology Institute (KEITI) through Post Plastic, a specialized program of the Graduate School funded by Korea Ministry of Environment (MOE).

A HOLISTIC VIEW OF COMMERCIAL PLASTICS CULMINATION IN DISASTROUS MICROPLASTICS POLLUTION IN THE ECOSYSTEM

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Bakelite's development in 1907 ushered in a material revolution by introducing polymers into global markets. Since then, the plastic products have piqued the interest of manufacturers and consumers due to their low cost, convenience and versatility. The usage of plastic in numerous applications such as packaging, household, electrical, construction, and many others has led to the manufacture of approximately 400 million tonnes of plastic every year, half of which is single-use plastic. It is estimated 60 percent of all produced plastic had already become waste, with a significant portion ending up in the ocean. This resulted due to poor waste management, inadequate recycling, littering, urban and stormwater runoff, sewer overflows, industrial activities, construction, and illegal dumping coming from land-based activities.

Besides, plastic fragmentation into microplastics as a result of solar UV radiation, currents, and other abiotic factors allows for direct ingestion by aquatic biota at various trophic levels. Numerous published articles indicated that micro, and nanoplastics have been spread over time throughout sediment, water, terrestrial, and marine organisms. Entanglement, suffocation, chemical leaching from plastic ingestion, the emergence of new habitats, and the introduction of invasive species are all significant ecological repercussions that pose increasing threats to biodiversity.

Although several countries throughout the world have policies in place to deal with plastic waste, they have yet to be properly enforced or implemented. Therefore, a summary of various policy options, the usage of circular economy, and sustainability methods is examined. To find practical solutions to plastic challenges, it is critical for collaboration between global, regional, and national levels, research institutes, and industries. It is also equally important for organizations and society to collaborate in order to teach communities and individuals how to reduce plastic pollution as part of a larger effort to combat plastic pollution.

Keywords: *Microplastics; degradation; implication; terrestrial and marine organisms*; *policies.*

MICROPLASTIC MONITORING AND RESEARCH IN THAILAND AND INTERNATIONAL COLLABORATION TO TACKLE MICROPLASTIC

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Marine plastic litter and microplastic are taking into account and highlighted as global issues since UNEA 2 in 2016. During UNEA 5.2 in February 2022, United Nations has agreed to set up Intergovernmental Negotiating Committee (INC) to negotiated on development of international legally binding agreement on plastic pollution. Thailand as one of lead country in ASEAN, and strong collaboration with ASEAN member states and international organizations to combat with marine litter, particularly plastic litter, and microplastic. The ASEAN Regional Action Plan for Combating Marine Debris in the ASEAN Member States (2021 – 2025) had been launched on 28 May 2021 for guiding ASEAN with 4 frameworks and 14 actions on marine debris. Thailand actively participates in regional and international level to end marine plastic pollution and microplastic. In order to achieve the goals, baseline assessments and scientific knowledge on marine plastic debris monitoring are requires and addresses.

To protect and reduce impact of marine plastic litter and microplastic on marine and coastal resources, the department of Marine and Coastal has conducted research on monitoring marine litter and microplatsic in marine ecosystem since 2017. The field sampling including beach sediment, water surface, and organisms' contamination survey along coastal provinces in Thai waters. The applied protocol on microplastic separation is based on laboratory method by NOAA (2015), after visual sorting under microscope, microplastic sample was identified using Fourier-transform infrared spectroscopy (FT-IR).

During the first period is to develop a suitable protocol for microplastic sampling techniques start from beach sediment in 2017, organisms and surface seawater were studied in 2018, the later period, regular sampling survey are conducted in 2019 - present. Total 21 beaches (26 stations) on beach sediment and 16 stations for seawater surfaces were seasonal sampling as twice a year. Microplastic size was classified into 3 group (size range): large (5000-1000 mm); medium (1000-300 mm); tiny (300-20 mm). The dominant microplastic as Polyethylene, Polyester, Polyethylene terephthalate (PET), Polystyrene, were found in the sediment. The microplastic accumulation in marine organisms; green mussel, from aquaculture farm in Phuket are PET and polyester in filament form (>90%); which is anticipate to originate from the drainage of washing machine.

Keywords: monitoring; microplastics; Thailand.

MICROPLASTIC POLLUTION AND ASSOCIATED CHEMICALS IN WATER ENVIRONMENTS

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Contamination by microplastics has become a burning environmental concern due to their rapid distribution in water environments. Oceans receive a large number of microplastics annually via river waters, direct dumping, and transportation. The concern on plastic-associated chemicals is receiving attention since microplastics are considered vectors for other contaminants such as potentially toxic elements and organic contaminants. These could associate with microplastics during the plastic production stage or while in the environment due to adsorption. Due to the latter mentioned reason, the adsorption from the environment, the analysis of microplastics becomes mandatory to estimate the microplastic associated chemicals and elements. Accurate estimation of these is important for several reasons such as exposure dosage estimations and potential toxicity estimations. The recent advances in microplastic-related analytical research include toxic element detection using x-ray fluorescence spectroscopy (XRF) and organic pollutant analysis with thermal desorption mass-spectroscopy (TD-MS). The present study focuses on the methodological developments with XRF and TD-MS on microplastic analysis and environmental sample analysis and reporting the detected concentrations of selected potentially toxic elements and organic compounds.

Keywords: Microplastic; Chemical Pollution; Potentially Toxic Chemical; Chemical Analysis; XRF; TD-MS

FATE OF MICROPLASTICS IN WASTEWATER TREATMENT PROCESSES

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Municipal wastewater treatment plants (WWTPs) have been a major emission source of microplastics (MPs) release into rivers and oceans. This research presents the impacts of seasonality on the fate and transport, and efficacy of microplastics (MPs) removal by wastewater treatment plant (WWTP) and membrane bioreactor (MBR). Sampling campaigns were carried out in several WWTPs in Bangkok metropolitan and Nonthaburi province, Thailand (2019–2020).

The results indicate that the average MPs removal efficiency of the WWTPs in Bangkok was about 84%. The aeration tank contributes greatly to the MP removal by transferring MPs from the water phase to sludge. The fate and transport of MPs at a WWTP in Nonthaburi were monitored in the dry and wet seasons. We found that MPs were mostly detected in the aeration process and were mostly rayon or polyester particles in fiber shape in the dry season. Whilst, in the wet seasons, MPs were found in influent water and aeration process, with PE, polyacrylate, and polyethylene terephthalate fragments as dominant fractions.

We analysed floc characteristics, microbial community compositions, and fouling behaviour and compared among four sequential batch-MBRs that were injected with different rates of MPs (polyester, polyamide, polypropylene and polyethylene) over a long operation period. The experimental results demonstrate that MPs lowered sludge floc size, floc hydrophobicity, and EPS molecular size, while they increased EPS concentration. Membrane fouling was lessened owing to the scouring effect of MPs. Our results were statistically analysed to establish applicability to novel knowledge of how MPs impact WWTP and MBR processes that may help in developing effective MP management strategies in MBRs and other wastewater treatment systems.

Keywords: Microplastics; Floc characteristics; Source identification.

MUNICIPAL SOLID WASTE SANITARY LANDFILL AND OPEN DUMPING: TWO CONTRAST SOURCES OF MICROPLASTICS ORIGINATION IN LANDFILL LEACHATE AND ITS FATE IN THE RESPECTIVE TREATMENT SYSTEM

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Recently, research studies in identifying Microplastics (MPs) from various environment has become a notable work, in the view of MPs as emerging pollutants as well as due to many undiscovered high-level impacts to both the environment and living beings. Out of many other sources, municipal solid waste land disposal methods, both sanitary landfills and open dumping are observed to be one of the major sources of MPs origination because of the predominant quantity of plastic wastes produced are being discarded in those methods. In this study, quantification, and characterization of MPs from the leachate generated from two different solid waste disposal methods and in their respective individual treatment systems were identified. From the studies, 20 different polymer types were spotted with the concentrations in the fresh leachate as 8.80 MPs/L and 9.93 MPs/L in the landfill and open dumping, respectively. The fibers, films and fragments are found to be the predominant polymer shapes in both the discarding process. Polypropylene and Polyethylene as the main prevailing polymer type in the sanitary landfill, whereas polyethylene and polystyrene in open dumping leachate samples. In addition, the analysis of the treatment system reveals, the ongoing units can remove the MPs from the leachate to some extent like it removed ~57.1% from landfill leachate using biological treatment combined with disinfection. Whereas ~75.2% from aerated lagoon and membrane treatment for leachate from the open dumping leachate. More fibers with varying polymer types were identified from the effluent of membrane treatment, which is due to the membrane used. Finally, 37 MPs/g from dewatered sludge and ~500 MPs/L of return sludge indicates the removal efficiency of these units which can reenter to the biological system allows to increase the MPs load.

Keywords: Leachate; Open dumping and sanitary landfill; Microplastics; Quantification; Characteristics; Treatment system

MICROPLASTICS IN COMMERCIAL BIVALVES HARVESTED ALONG THE GULF OF THAILAND COASTLINES

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Microplastics have emerged as one of today's prominent emerging pollutants owing to their pervasiveness in the environment and tendency to accumulate in animals. Marine bivalves notably along the coastlines are also impacted by microplastic contamination since they remove large quantities of suspended material when they filter feed. Therefore, they are often selected as bioindicator species for microplastics in the ocean. In this study, we examined quantities and characteristics of microplastics found in four commercial bivalves (i.e., mussels, oysters, cockles and clams) grown along the coastlines of the Gulf of Thailand (specifically in Chonburi, Samut Sakhon, Samut Songkhram, Phetchaburi, Chumphon, and Surat Thani provinces). Overall, the microplastics found had an average of 1.87±0.86 items/individual or 0.46±0.31 items/gram ww. Highest microplastic abundance was found bivalves from Samut Sakhon coasts while the lowest was from Chonburi. Filaments/fibers were the major shape found in all bivalve samples. The average microplastic size was 389 microns while the majority of the microplastic items fall in the 101-to-500-micron size range. To this end, we posit that spatial variation of microplastics in bivalves from six different provinces may be significant in assessing the risks microplastic ingestion by human via bivalve consumption and useful for stakeholders in determining management priorities for microplastic pollution.

Keywords: microplastics; bivalves; Gulf of Thailand

MICROPLASTICS IN ARCTIC FJORD: KONGDFJORDEN, NY-ALESUND, SVALBARD, ARCTIC

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Microplastics are tiny (<5mm) plastic fragments of global concern. As microplastics (MPs) are highly pervasive and ubiquitous in distribution, they are reported from most of the terrestrial, freshwater, estuarine and marine ecosystems across the world. Occurrence of MPs in pristine Arctic and Antarctic environments has also been confirmed. However, studies reporting MPs in Arctic oceans are comparatively limited. Similarly, MPs contamination of Arctic fjord systems are understudied. Hence the present study was conducted to assess the MPs contamination in water and sediment matrices of Kongsfjorden, Ny-Ǻlesund, Svalbard. Kongsfjorden is an established reference site for Arctic marine studies. Water and sediment samples were collected from this fjord during the Indian Arctic Expedition-2019 (summer batch 2) with the help of microplastic net and sediment grab sampler respectively.

The samples were processed following National Oceanic Atmospheric Administration protocol. MPs were observed under stereomicroscope (Carl Zeiss, Stemi 508) for characterization. Accordingly, in water samples, most of the MPs recorded were of fiber (67%) in shape followed by fragments (19%), sphere (11%) and film. Polymer analysis of the MPs with micro-Raman spectrometer (WITec Alpha 300RA, Germany) identified more than 15 types of polymers, of these Polyamide, High density polyethylene, Polystyrene and Polypropylene were the predominant type of polymers found. In the case of sediment samples fragments were dominant followed by fibers. High density polyethylene, Polyamide, and Low-density polyethylene are the polymers recorded in sediments samples. The findings of this study confirm the occurrence of MPs in water and sediment compartments of Arctic fjord Kongfjorden. Further detailed studies are need to understand the source and impact of MPs on this Arctic fjord ecosystem.

Keywords: Marine plastics, Arctic fjords, Polymer, Polar studies, Raman spectroscopy.

MICROPLASTICS IN SURFACE WATER AND SEDIMENT OF A TROPICAL ESTUARY IN MEKONG RIVER DELTA, VIETNAM

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Mekong River Delta is the largest delta in Vietnam which contributes to more than half of the country's production of food, including rice, fruits, and aquaculture products. The MRD is especially vulnerable to climate change and the aquatic environment is seriously contaminated by various pollutants such as plastic wastes and wastewater from aquaculture, agriculture, craft villages, households, and industries. This study aimed to assess the microplastic contamination in surface water and sediment of the Tien River, the Mekong's northern branch flowing through the MRD. The results showed that the average concentration of microplastics over the entire area was 53.8 ± 140.7 items m^{-3} in surface water and 6.0 ± 2.0 items g^{-1} dried weight in sediment. Further, there was a predominance of microplastic fibres rather than fragments, with this form comprising 85% and 98% of the microplastics in the surface water and the sediment, respectively.

Keywords: developing country, Tien River, fibre, fragment

ANALYSIS OF MICROPLASTICS IN DRINKING WATER AND OTHER CLEAN WATER SAMPLES – CHALLENGES AND OPPORTUNITIES FOR NORMALIZATION

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The presence of microplastics in the surroundings has become a growing concern for people. From daily use objects to environment, microplastics may now be found in the air we breathe, the food we eat and the water we drink. Unfortunately, large number of scientific studies is still dubious because of the lack of quality aspects about the reliable measurements of data. This presentation explains all the technical challenges and pitfalls that could interfere the reliability of data generated during the analysis of microplastics in water through spectroscopic techniques. These techniques allow to reach correct characteristics as number, size, and identification of microplastics amongst microparticles. We will review all the analytical streams; from adequate analysis equipment, lab preparation to reduce ubiquitous cross contamination, filter selection, sample preparation, blank management, signals interference and data interpretation, algorithm matching, limit of reporting, recovery rates, false positives and negatives, verification and validation of analytical method up to expression of results.

To face these numerous and different challenges, a technical working group of European expert laboratories (universities, technical institutes, authority labs, commercial labs, industry labs) have worked for 2 years to share their experience, to harmonize and improve a common set of minimum requirements and best practices for performing accurate and reliable analysis of microplastics in clean water matrix. These different harmonized elements should be applied by each laboratory claiming its capabilities on microplastic analysis. The defined guidelines have been used to settle the backbone of the normalization documents in AFNOR and ISO streams in order to deliver final national and international norms on the analyses of microplastics in clean water by March 2024 at the latest.

Keywords: Microplastics; Analysis; Water; Guidelines; Method validation; Normalization.

MICROPLASTIC ABUNDANCE AND REMOVAL IN TWO WASTEWATER TREATMENT PLANTS IN THAILAND

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Wastewater treatment plants (WWTP) is one of the land-based sources of microplastics (MPs) in the ocean. This study investigated MP removal efficiencies of two conventional WWTPs (A1 and A2) located in Bangkok, Thailand. WWTP-A2 employs a pilot-scale ultrafiltration (UF) as a post-filtration step. MP abundances in the influent of A1 and A2 were 16.55±9.92 and 77±7.21 MPs/L, respectively. The effluent of A1 and A2 detected an average of 3.52±1.43 and 10.67±3.51 MPs/L. A conventional treatment system in WWTP-A2 built as a closed underground system achieved 81.91% MP removal which is more efficient than A1. The addition of a UF unit improved the overall MP removal efficiency of A2 to 96.97%. However, a substantial number of MPs is released to water bodies daily when a large treatment volume is considered. The largest size fraction of MPs was 0.5 – 0.05 mm, and fibers dominated MP samples from both study sites. Most fibers were identified as polyethylene terephthalate (PET) by a Fourier Transform Infrared Spectroscopy (FT-IR). MPs retained in the sludge ranged from 4.74×10^4 to 2.63×10^4 particles per kilogram of dry sludge. Sludge application as soil amendment can be a route for MPs to transport to soil environment. The study shows that the design of WWTPs and advanced tertiary treatment can improve MP removal efficiency of a WWTP. Moreover, both WWTPs have a lack of primary sedimentation which may influence the removal efficiency.

Keywords: Microplastics; Wastewater treatment plant; Sludge; Tertiary treatment; Ultrafiltration.

MICROPLASTICS REMOVAL AND SUBSEQUENT RECYCLING TOWARD SUSTAINABILITY

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Microplastics (MPs), as emerging contaminants, have gained increasing global attention due to their wide distribution and serious threats. Physical techniques are effective for separating MPs from water environment such as wastewater treatment plants, but the disposal of the separated MPs becomes an emerging problem. A novel strategy of MPs separation and subsequent sustainable disposal is proposed. MPs separation was effectively obtained via iron coagulation. Conversion of the coagulated material into carbon material was conducted by facile carbonization. The formation of magnetic carbon/iron nanocomposite was verified by various characterization methods. Carbon/iron nanocomposite obtained at 800°C (MPC800) was used as heterogeneous catalyst for evaluating the degradation of a toxic Rhodamine B (RhB). The effects of H_2O_2, pH, and temperature on degradation performance were studied associated with RhB removal efficiency and kinetic rate analysis. Under proper conditions, RhB removal of 97.57% was obtained at 20 min. The activation energy of RhB degradation is 46 kJ/mol, lower than that of previous reports. Quenching tests and electron spin resonance spectra verified the dominant role of •OH radical in RhB degradation. Conversion of MPs into effective catalyst for wastewater treatment offers a sustainable strategy for MPs disposal, guided by the "waste treating waste" concept.

Keywords: Microplastics; Recycling; Degradation; Organic pollutants; Coagulation.

THAILAND PPP-PLASTICS: A PUBLIC-PRIVATE PARTNERSHIP TO TACKLE PLASTIC POLLUTION IN THAILAND VIA POLICY, RESEARCH AND EDUCATION

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Thailand has been facing the challenges of waste management and the negative impacts of waste pollution. In 2020, approximately 25.37 million tons of solid waste were generated in the Thailand. It was estimated that only 8.36 million tons of the solid waste (33%) were recycled and only 9.13 million tons (36%) were properly managed. Approximately 7.88 million tons (31%) of the solid waste were missed managed. Plastic waste is generated approximately 2 million tons/ year in the country and only approximately 25% of this plastic were recycled. The non-recycled plastic waste comprised mainly of single-use plastic including plastic bags, plastics cups, plastics straw and Styrofoam.

Sustainable plastic waste management requires partnership of multi-sectoral stakeholders. Thailand PPP-Plastics was established in 2018 to support the national roadmap on plastic waste management. In addition, PPP-Plastics also support the circular economy initiative under the national agenda on BCG Model. PPP-Plastics address plastic waste management through policy and research innovation; and awareness raising and education. For policy support, PPP-Plastics actively engages in the national policy development, implementation and monitoring, while developing model and infrastructure for collecting recyclable plastic waste, and managing waste in big cities. For research and innovation, PPP-Plastics studies plastic material flow and develops material flow analysis database which is critical for informed policy and monitoring the policy implementation. In addition, through collective efforts, PPP-Plastics initiated a numbers of innovation to recycled and upcycling used plastics. This includes a study on using recycled plastics in road construction. Lastly, PPP-Plastics promotes sustainable used of plastics and plastics waste management through awareness raising campaign, project activities and national educational program on circular economy.

Keywords: Plastic Pollution; Thailand; Public and Private Partnership; Research; Education.

BUILDING CAPACITY FOR MICROPLASTIC MONITORING AND EVIDENCE-BASED POLICYMAKING

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Microplastics (MPs) and plastic-related chemical pollution are widely discussed in the literature. The presence of MPs in environmental compartments create adverse impacts on ecological systems and potential exposure of human through several pathways. Hence monitoring plays an important role in upstream and downstream mitigatory measures. The present study focussed on capacity building of potential stakeholders for the MPs monitoring and regulatory measure development. The situational analysis and training need assessment (TNA) of the two countries, Sri Lanka and Vietnam was extensively conducted by using a structured questionnaire, and then information validation was conducted through stakeholder consultations and technical experts (national, regional, and international). Tow working groups consisting of thematic leaders, consultants, and local and international experts were formed for each country for the TNA. The study recognized and proposed, a) education, b) resources and c) institutionalization three main areas for capacity building. The education of the potential stakeholders included a foundation course module on MPs and an advance course module on MPs sampling, analysis, and data reporting for the identified stakeholders in the MPs monitoring chain. The identified area included the selection of sampling locations and sampling methods for water, wastewater, fertilizer, and soil; pre-treatment and transportation samples under the required conditions; selection and development of analytical methods for water, wastewater, fertilizer, and soil samples; identification and quantification of plastic polymer, their state, and potential risk; methods used in data analysis and reporting with minimum information; and use of appropriate data sharing platforms and citizen science data usage.

Keywords: microplastics; capacity building; monitoring; evidence-based policy; training needs assessment.