The Rapids

US EPA's Trash Free Waters Monthly Update

April 2024

epa.gov/trash-free-waters

Introduction

Hello all,

On March 20-21, I was able to attend the World Wildlife Fund's second Plastic Policy Summit. As was the case last year, this was an incredibly informative meeting with a lot of major players in the plastics arena attending to share insights into how to solve the problem of plastic waste in the environment. Sessions covered extended producer responsibility (a lot of movement on the state level on this front!), decreasing harmful impacts from plastic waste, modeling scenarios to reduce plastic pollution, state policy, activating existing federal authorities, mapping capacity, knowledge gaps and much more. I was especially interested in the sessions related to reuse, which is a critical piece of the solution space for this important problem—Trash Free Waters is forging ahead with its own partnership with the NGO Perpetual to launch city-scale reusable foodware systems in four cities around the United States, with the lessons learned from those efforts to be shared down the road so that other cities interested in similar efforts can learn from what we did. But most importantly, it was inspiring to see so many great thought leaders sharing their efforts and stories and to speak with them in person. A big thanks to World Wildlife Fund for hosting this wonderful event!

The Environmental Law Institute and Monterey Bay Aquarium just released a report showing how the U.S. government can significantly move the needle towards its goal of eliminating the release of plastic into the environment by the year 2040 using currently available authorities. The analysis, *Existing U.S. Federal Authorities to Address Plastic Pollution: A Synopsis for Decision Makers*, offers a comprehensive overview of existing federal legal authorities—including laws, regulations, and executive actions—that can accomplish the goal set by the Biden-Harris Administration. I hope you find the time to read through this report!

In December, As You Sow filed a shareholder resolution asking the U.S. tobacco company Altria to take responsibility for plastic pollution due to its discarded cigarette filters. This resolution was the first-of-its-kind and has the power to inspire extended producer responsibility tobacco laws in the United States. Actions like this could greatly reduce plastic pollution—used cigarette filters are the most littered item globally and make up the largest proportion of plastics entering waterways each year.

Please share any upcoming events with me at nandi.romell@epa.gov so that the Trash Free Waters Team can advertise these opportunities.

Romell Nandi
US EPA
Trash Free Waters National Program Lead

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EPA Announcements

The EPA Seeks Comments on Listing of Specific PFAS as Hazardous Constituents
The EPA is proposing to amend its regulation under the Resource Conservation and Recovery Act by adding nine specific per-and polyfluoroalkyl substances (PFAS), their salts, and their structural isomers, to its list of hazardous constituents. These nine PFAS are perfluorooctanoic acid (PFOA), perfluorooctanesulfonic acid (PFOS),

perfluorobutanesulfonic acid (PFBS), hexafluoropropylene oxide-dimer acid (HFPO–DA or GenX), perfluorononanoic acid (PFNA), perfluorohexanesulfonic acid (PFHxS), perfluorodecanoic acid (PFDA), perfluorohexanoic acid (PFHxA), and perfluorobutanoic acid (PFBA). The notice was published in the Federal Register in February. **Comments are due April 8, 2024**.

The EPA Issues PFAS Test Order as Part of National Testing Strategy

The EPA has issued the fourth Toxic Substances Control Act test order requiring testing on PFAS under the EPA's National PFAS Testing Strategy, the latest action taken under the EPA's PFAS Strategic Roadmap to confront contamination from "forever chemicals" nationwide. This action orders the 3M Company and Wacker Chemical Corporation to conduct and submit testing on the physical-chemical properties of 2-(N-Methylperfluoro-1-octanesulfonamido)ethanol (NMeFOSE) (Chemical Abstract Service Reference Number: 24448-09-7), including testing on the health effects following inhalation of this chemical. NMeFOSE has been used widely in products, including clothing and carpet treatments as well as furniture coatings (paint and varnish). NMeFOSE has been found in the air and in biosolids, which are a byproduct of the water treatment processes often used on agricultural fields as fertilizer. Studies have also demonstrated that NMeFOSE can accumulate in indoor dust and air, as well as in outdoor environmental media. In the National PFAS Testing Strategy, the EPA assigned PFAS into smaller categories based on similarities in structure, physical-chemical properties and existing toxicity data. The EPA is issuing test orders for PFAS in specific categories that lack toxicity data to inform the EPA's understanding of the potential effects on human health and the environment.

Funding Opportunities

TrashBlitz Community Fund

In 2023-2026, 5 Gyres' TrashBlitz program will expand to six new cities/regions with the support of local coalitions and organizations. They will award funding and on-the-ground support to groups that can leverage the TrashBlitz research platform to drive change in their communities. This year, 5 Gyres will award one group with $10,000 to execute a TrashBlitz in their region and commit to collecting, tracking and analyzing a minimum of 15,000 data points. In addition to funding, awardees will receive a toolkit of templatized outreach materials, volunteer training, logistical support, data analysis and report production support. **Applications are due April 1, 2024**.

Pollution Prevention Grant Program Funded by the Bipartisan Infrastructure Law

The EPA is accepting applications for a two-year competitive funding opportunity for eligible entities to provide technical assistance to businesses to encourage pollution prevention. Applications must address at least one of the pollution prevention National Emphasis Areas, which include: Food and Beverage Manufacturing and Processing; Chemical Manufacturing, Processing and Formulation; Automotive Manufacturing and Maintenance; Aerospace Product and Parts Manufacturing and Maintenance; Metal Manufacturing and Fabrication; and Supporting Pollution Prevention in Indian Country and Alaska Native Villages. Eligible applicants include states, state entities such as universities, U.S. territories and federally recognized Tribes and intertribal consortia. Total estimated funding for awards is $13.9 million, with individual awards of up to $350,000. **Applications are due on May 17, 2024.**

Columbia River Basin Restoration Funding Assistance Program: Science and Monitoring Competition

The EPA Region 10 is accepting applications from eligible entities to improve the understanding of toxics and their effects on water quality in the Columbia River Basin. Eligible activities must assist in either monitoring to evaluate trends or promoting citizen engagement or knowledge. State governments, Tribal governments, regional water pollution control agencies and entities, local government entities, nongovernmental entities and soil and water conservation districts are eligible to apply. The EPA expects to distribute up to $15,000,000 under this opportunity, with individual awards of up to $3,000,000. **Applications are due on May 17, 2024.**

Upcoming Events

The Zero Waste Forum & International Dialogue

April 2-6, 2024, San Francisco, CA

Hosted by Race to Zero Waste and partners, The Zero Waste Forum & International Dialogue is a 5-day event of zero waste collaboration, education and fun. The event includes Zero Waste USA's Intro to Zero Waste course, guest speakers, Bay Area zero waste businesses and organizations, a tour of the Recology San Francisco facility and more.

Plastics & Climate: Exploring What We Know, Impacts on Vulnerable Communities, and How to Solve the Problem

April 4, 2024 (2:30 pm ET), virtual

Trash Free Waters is hosting a webinar to discuss the relationship between plastics and climate change. During this webinar, expert panelists will provide information on the effects of plastic consumption and production on climate change and answer audience questions about this serious problem. Panelists include: Alice Zhu, PhD Candidate & Vanier Scholar at the University of Toronto + Co-Founder of Plastics & Climate Project; Dr. John Doherty, Science and Policy Analyst at Environmental Law Institute; and Margaret Spring, Chief Conservation and Science Officer at Monterey Bay Aquarium.

Microplastics in the Coastal Region 2024 Conference

April 8-9, 2024, Charleston, SC

This conference, hosted by NOAA's National Centers for Coastal Ocean Science and the South Carolina Sea Grant Consortium, will highlight professional and student work and community science activities related to microplastics and nanoplastics research and mitigation efforts. The conference will feature networking and professional development opportunities, learning sessions, expert panels and more.

Center for Watershed Protection National Watershed & Stormwater Conference

April 8-11, 2024, Kansas City, MO

The 2024 National Watershed and Stormwater Conference offers a forum for watershed and stormwater professionals across the U.S. to learn how to increase community resilience in response to new and existing threats to water resources. The conference will feature technical presentations, case studies, panel discussions and workshops.

Planet Tracker Sustainable Finance Research Update

April 9, 2024 (10 am ET), virtual

During this webinar, Planet Tracker staff will provide an update on their latest research on various topics including: how economic sectors dependent on exploitation of nature underperform sectors that are not, key water risk in the textile industry and the financial impact of companies promoting environmentally harmful products. Speakers include: Nicole Kozlowski, Head of Engagement; Francois Mosnier, Head of Oceans Program; Dominic Lyle, Director of Communications; and Richard Wielechowski, Senior Investment Analyst (Textiles).

Plastics in Politics Livestream

April 9, 2024 (2 pm ET), virtual

This month's Plastics in Politics Livestream will look at plastics industry activity in Washington, where the PET resin industry joined an unusual coalition lobbying for a national bottle bill, the flexible packaging industry looked to up its politics and money game by launching a political action committee and other plastics industry groups held their annual Washington lobby days. Plus, preview the fourth round of plastics treaty talks, which will start up two weeks after the webinar.

Plastic Solutions & Health Summit

April 10, 2024 (9-10:20 am ET), Washington, D.C.

Environmental Health Sciences, A Plastic Planet, and the Plastic Health Council are collaborating to host the Plastic Solutions and Health Summit (no website available). This in-person event will be held at the Carnegie Endowment for International Peace and will bring together insights from ocean explorers, materials and systems innovators and health scientists in a TED-talk style format. If you would like to attend this event, RSVP via email to katherine@ehsciences.org.

Moving the Needle on Reuse: Reusable Food Service Ware (Part I)

April 10, 2024 (2-3 pm ET), virtual

This event, hosted by the EPA Office of Chemical Safety and Pollution Prevention, is the first of two webinars about reusable food service ware. This webinar will describe the range of support at the EPA and elsewhere for expanding reusable food service ware and will explore how Pollution Prevention grantees are using EPA resources to support the use of reusable food service ware in their organizations.

Chemicals in Plastics: Human Health Costs

April 18, 2024 (1 pm ET), virtual

The Endocrine Disrupting Chemicals Strategies Partnership is hosting a webinar on the human health costs of chemicals in plastics. This webinar will explore global studies that have documented how exposure to endocrine disrupting chemicals through plastic materials has contributed to infertility and non-communicable diseases—with estimated annual human health costs of $250 billion per year related to plastics. Dr. Leonardo Trasande will discuss research on birth outcomes, using data from the U.S. National Institutes of Health Environmental Influences on Child Health Outcomes program.

Save the date for future months…

Circularity 24: Accelerating the Circular Economy

May 22-24, 2024, Chicago, IL

The 2024 Circularity conference will convene thought leaders and practitioners across industries and value chains who are working to build the circular economy. The conference will feature keynotes, breakouts, an expo and networking opportunities. It will focus on the following tracks: Business Innovation & Strategy, Enabling Policies, Materials Revolution, Next-Gen Products & Packaging, Stakeholders & Social Impacts and Supply Chain Transformation.

New York State Microplastics Summit

June 5-7, 2024, Buffalo, NY

The New York State Microplastics Summit will provide an opportunity for diverse stakeholders to discuss concerns about microplastics impacts on the environment, human health, wildlife conservation and environmental justice. Participants will connect and collaborate on microplastics issues in New York State, discuss current microplastics research, determine research and policy gaps and work to better understand how to move towards solutions. *Note that registration for this event is by invitation only.*

2024 StormCon

August 27-29, 2024, Reno, NV

StormCon is a conference and exhibition focused on stormwater and surface water quality. This year, the conference will feature presentations and discussions on: green infrastructure; flood modeling & mitigation; programs, permits and compliance; transportation & construction stormwater; BMP monitoring; industrial stormwater management; and erosion control.

In case you missed it…

Micro- and Nanoplastics in Marine Sediment: Detecting Particles and Assessing Impacts on Benthic Communities

Dr. Marissa Giroux, a Research Biologist at the EPA's Atlantic Coastal Environmental Sciences Division, presented on methods for extracting, identifying and quantifying microplastics, as well as the limitations of measuring these particles.

Filtered Water: Preventing Billions of Plastic Bottles from Flooding U.S. Communities

Plastic Pollution Coalition hosted a panel to discuss how the proactive distribution of water filters is a sustainable and affordable solution for providing clean water to U.S. citizens who are waiting for lead pipe replacements. Panelists included: Deandrah Cameron, Policy Manager at New Jersey Future; Dr. Sherri Mason, Associate Research Professor and Director of Sustainability at Penn State Erie Behrend College; and John Rumpler, Clean Water and Get the Lead Out Director at Environment America.

[Circular Economy Mapping: What is a Circular Roadmap & Why Do We Need One?]

This webinar discussed how to effectively utilize the possibilities of circular economy road mapping. The webinar included a panel discussion on how roadmaps help policy makers, corporations, and regional/sector bodies to collaborate on developing and implementing frameworks and outcomes. Panelists included: Clemence Bethencourt, a Sustainability Consultant who has helped companies reduce plastic usage, and Dr. Halid Abu-Bakar, a Circular Economy Adoption and Implementation Strategist.

The Microplastics Breakdown

MICROPLASTICS AND HUMAN HEALTH

Microplastics and Nanoplastics in Atheromas and Cardiovascular Events

Raffaele Marfella, M.D., Ph.D.; Francesco Prattichizzo, Ph.D.; Celestino Sardu, M.D., Ph.D.; Gianluca Fulgenzi, Ph.D.; Laura Graciotti, Ph.D.; Tatiana Spadoni, Ph.D.; Nunzia D'Onofrio, Ph.D.; Lucia Scisciola, Ph.D.; Rosalba La Grotta, Ph.D.; Chiara Frigé, M.Sc.; Valeria Pellegrini, M.Sc.; Maurizio Municinò, M.D., et al.

This study involved 304 patients undergoing carotid endarterectomy**[1]** for asymptomatic carotid artery disease, 257 of whom completed a follow-up. Specimens of excised carotid plaque taken from these patients were analyzed for the presence of microplastic and nanoplastic particles (MNPs) using a few methods, including pyrolysis–gas chromatography–mass spectrometry. The primary end point that was examined was a composite of myocardial infarction, stroke, or death from any cause among patients who had evidence of MNPs in plaque as compared with patients with no evidence of MNPs. Polyethylene was detected in the carotid artery plaque of 150 patients and 31 patients were found to also have polyvinyl chloride. Significantly, patients in whom MNPs were detected within the atheroma**[2]** were found to be at higher risk of a composite of myocardial infarction, stroke or death at 34 months of follow-up than those in whom MNPs were not detected.
https://www.nejm.org/doi/10.1056/NEJMoa2309822

[1] Carotid endarterectomy is a procedure to treat carotid artery disease. This disease occurs when fatty, waxy deposits build up in one of the carotid arteries. https://www.mayoclinic.org/tests-procedures/carotid-endarterectomy/about/pac-20393379
[2] Atheroma is the medical term for the buildup of materials that adhere to arteries. Among others, these include: fat, cholesterol calcium, connective tissue, inflammatory cells. This buildup (also known as atherosclerotic plaque) can accumulate over time. The buildup can narrow an artery enough that it severely restricts blood flow — or even blocks the artery altogether. In some cases, pieces of the plaque can break away. When that happens, the body responds by producing a blood clot, which can further block artery walls. If atheromas become big enough, they can lead to serious health issues, including heart attack and stroke.
https://www.healthline.com/health/atheroma

Microplastics in Human Urine: Characterization Using Mftir and Sampling Challenges Using Healthy Donors and Endometriosis Participants

Jeanette M. Rotchell, Chloe Austin, Emma Chapman, Charlotte A. Atherall, Catriona R. Liddle, Timothy S. Dunstan, Ben Blackburn, Andrew Mead, Kate Filart, Ellie Beeby, Keith Cunningham, Jane Allen, Hannah Draper, Barbara-ann Guinn

This study examined the presence of microplastics in 48 human urine samples that were taken from healthy individuals and people with endometriosis. These samples were compared based on the presence, levels and the characteristics of the particles. Urine samples were collected from 19 patients at the Hull and East Yorkshire Endometriosis Centre at Castle Hill Hospital, Hull University Teaching Hospitals NHS Trust and from 29 healthy donors, who provided samples collected at their homes in the United Kingdom. Researchers identified 123 microplastic particles in 17 of the samples taken from healthy donors. These particles consisted of 22 different polymer types. The researchers found 232 microplastic particles in twelve of the urine samples from participants with endometriosis. These particles consisted of sixteen polymer types. Polyethylene, polystyrene, resin and polypropylene polymer types were the most prevalent in healthy donor samples, compared with polytetrafluoroethylene (PTFE) in samples from endometriosis participants. The microplastic particle levels within healthy and endometriosis participant samples were determined not to be significantly different. However, the size ranges found in healthy samples as compared to the samples from participants with endometriosis were different. The microplastic particles identified in the samples from the endometriosis participants were larger and

more irregularly shaped, which the researchers asserted could result in inflammatory responses, but they also acknowledged that this would need to be confirmed by further analysis. The researchers asserted that their findings support the phenomenon of transport of microplastics within humans, specifically to the bladder. Additionally, they observed that their results raise important new questions with respect to transport around the body and how microplastics have traversed, or by-passed, the kidney glomerular filtration system with dimensions that are seemingly an order of magnitude too large to navigate such organs, as well as the potential biological impacts as a result of their presence. **Read the full abstract:**
https://www.sciencedirect.com/science/article/pii/S0147651324002847

HUMAN EXPOSURE TO MICROPLASTICS

Microplastics Contamination in Water Supply System and Treatment Processes

Ngoc-Dan-Thanh Cao, Dieu-Hien Thi Vo, Mai-Duy-Thong Pham, Van-Truc Nguyen, Thanh-Binh Nguyen, Linh-Thy Le, Hussnain Mukhtar, Huu-Viet Nguyen, Chettiyappan Visvanathan, Xuan-Thanh Bui

This review focused on microplastics (MPs) in water supplies, including bottled water, with an assessment of the potential impacts of MPs on humans. The main challenges associated with current technologies were identified as stemming from the ability/inability to effectively treat and completely remove MPs from drinking water. The authors reported that MPs have been detected in tap water in a variety of shapes such as fibers, fragments, spheres and films with wide -ranging sizes from 1 -5000 µm. Furthermore, based on their review, MPs have been detected in most water samples of tap water or effluent from drinking water treatment plants. Fragments and fibers were found to comprise most MPs found in all water samples, primarily composed of polyethylene (PE), polypropylene (PP), and polyethylene terephthalate (PET). One hypothesis for the source of MPs in tap water was a link to the materials used in transportation pipelines within drinking water treatment plants or supply chains. The authors observed that given the frequent detection of MPs in drinking and bottled water, it is imperative to implement comprehensive management strategies to address this issue effectively. Consequently, they asserted that integrating current technologies with management options such as life-cycle assessment, circular economy principles and machine learning is crucial to eliminating this pervasive problem. **Read the full abstract:**
https://www.sciencedirect.com/science/article/pii/S0048969724019363

Microplastics in Indoor Deposition Samples in University Classrooms

Mansoor Ahmad Bhat

As described, the goal of this study was to comprehensively analyze the physical and chemical properties of microplastics found in university classrooms. Deposition samples were taken in March 2022 from the four classrooms in the civil engineering department of Eskişehir Technical University in Turkey. Fibers of varied colors comprised the most predominant form of microplastic identified and this was attributed to clothing. Microplastic size was found to have varied significantly across different classrooms, with a general average size range of 120–2222 µm. The morphology of the detected particles varied and included cracks and grooves, which the author asserted pointed to the potential degradation into nanosized plastics over time. Eleven types of microplastics were identified using µRaman analysis and were thought to originate from clothing, shoes and stationery. The majority of the microplastics were found to be polyamide 6, polypropylene and polyamide 12. According to the author, his findings aligned with previous research and underscored the need for a better understanding of microplastics' structural components and any possible contaminants. **Read the full abstract:**
https://link.springer.com/article/10.1007/s44274-024-00054-0

Uncovering Microplastics Contamination in Canned Seafood

Diogo M. Silva, C. Marisa R. Almeida, Francisco A. Guardiola, Rúben Pereira, Sabrina M. Rodrigues, Sandra Ramos

In this study, 60 cans of seafood representing four popular brands purchased from two supermarkets in the city of Porto, Portugal, were assessed for microplastic content. Six different types of seafood products were included: i) sardine in tomato sauce; ii) sardine in sunflower oil; iii) octopus in tomato sauce; iv) mussels in escabeche sauce; v) tuna in olive oil; and vi) chub mackerel in sunflower oil. For each seafood type, 10 cans from the same brand were studied. The researchers found that all types of the canned seafood examined had microplastics. Fibers were the most common type of shape found, blue being the most prevalent color and polyester as the most common polymer. While not statistically significant, cans containing octopus in tomato sauce and tuna in olive oil were found to have the highest levels of microplastics. The number of microplastics in the seafood tissues were found to be significantly higher than in the immersion liquids. The authors asserted that their results provided conclusive evidence of microplastic contamination in a wide range of commercially

available canned seafood products. They also highlighted that a better understanding of the possible microplastic inputs from the capture of seafood organisms, through all industrial canning stages (including the incorporation of external ingredients potentially contaminated with microplastics) until the final product available to consumers, is crucial. This knowledge, they asserted, is essential for insights into the presence of MPs in canned seafood and for the implementation of effective prevention measures. They cited current research that estimated an individual's maximum intake at 226 MPs per capita per year (based on available data from USA consumers), as providing another valuable insight into the potential quantity of microplastics that an individual ingests through the consumption of canned seafood. Furthermore, the researchers noted that no food products are regulated concerning the presence and concentration of microplastics and recommended that further studies on the possible risks for human health due to microplastics ingestion are needed. **Read the full abstract**: https://www.sciencedirect.com/science/article/pii/S0308814624006988

MICROPLASTICS FATE AND TRANSPORT

Formation of Secondary Microplastics During Degradation of Plastics Originating from the MV X-Press Pearl Maritime Disaster

G. M. S. S. Gunawardhana, U. L. H. P. Perera, Amila Sandaruwan Ratnayake, W. A. D. B. Weerasingha & H. C. S. Subasinghe

This study examined the degradation process of plastic pellets into secondary MPs under the extreme conditions of fire and exposure to chemicals during the 2021 MV X-Press Pearl maritime disaster, which took place during the southwest monsoon season. An estimated at 1680 tonnes of plastic nurdles or pellets measuring less than 5 mm were released into the Indian Ocean during this incident. Beach sand samples were collected from 40 locations along the affected west coast of Sri Lanka. An additional 20 samples were collected for a background study covering the entire coastline of Sri Lanka. Analysis of the findings, which included a positive correlation between large and total secondary microplastics (MPs) and the plastic pellets pollution index, indicated that a considerable amount of plastic pellets were degraded into secondary MPs within 6 to 8 days after the accident, under the influence of nitric acid and heat/fire. These secondary MPs were found to mainly be composed of low-density polyethylene (LDPE) and linear low-density polyethylene (LLDPE). The authors observed that these lightweight polymers have the potential to spread across a wider region, functioning as a transoceanic marine pollutant and thus posing a severe threat to marine ecosystems around the world. **Read the full abstract:** https://link.springer.com/article/10.1007/s44274-024-00044-2

Plastic Pellets Blight Belgian Town as EU Weighs Action

Julien Girault

This article focused on microplastic pollution in Ecaussinnes, a small town in Belgium that is home to the country's second largest petrochemical complex. As described, microplastics have been in the soil, dotting riverbanks and bobbing along streams. The main source of these particles was attributed to the production of more than a million tonnes of nurdle pellets per year in the town. The town had taken steps to remove some of the pellets from the environment, including installing filtering dams on streams, which is associated with the risk of killing amphibians. The town has also taken legal action against the companies producing the pellets. This article also described some potential actions under consideration by the European Union, including a proposal aimed at reducing pellet spillage and a separate law on environmental crimes, which could enable sanctions against companies' negligent behavior that resulted in the release of nurdles into the environment. **Read the full article:** https://phys.org/news/2024-02-plastic-pellets-blight-belgian-town.html

MICROPLASTIC REMOVAL

Advances In Chemical Removal and Degradation Technologies for Microplastics in the Aquatic Environment: A Review

Tianhong Zhou, Shangjian Song, Rui Min, Xin Liu, Guozhen Zhang

This literature review summarized recent research on the chemical removal and degradation of microplastics in water. The article included a discussion of the chemical mechanisms underlying the removal/degradation of microplastics and identified some of the key factors that influence the treatment process. Chemical treatment technologies for microplastics in water were described as mainly involving two mechanisms: removal and degradation. During chemical removal, microplastics undergo a process of deposition or coagulation, which effectively separates them from the water. Chemical degradation, in contrast, guides microplastics through a process of degradation or decomposition. The authors analyzed the performance of microplastic treatment

technologies, while also considering the impact of microplastic characteristics, operational conditions and other parameters on the effectiveness of the treatment methods. The effects of different removal/degradation technologies and the removal/degradation mechanisms were explored. Effects of factors such as the performance of each technology, the characteristics of microplastics, and the operating conditions on the treatment of microplastics were analyzed. The review also included a discussion of the advantages and disadvantages of different treatment technologies. **Read the full abstract:**
https://www.sciencedirect.com/science/article/abs/pii/S0025326X24001796

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