Standardized approach replicates microplastics in the lab with greater precision

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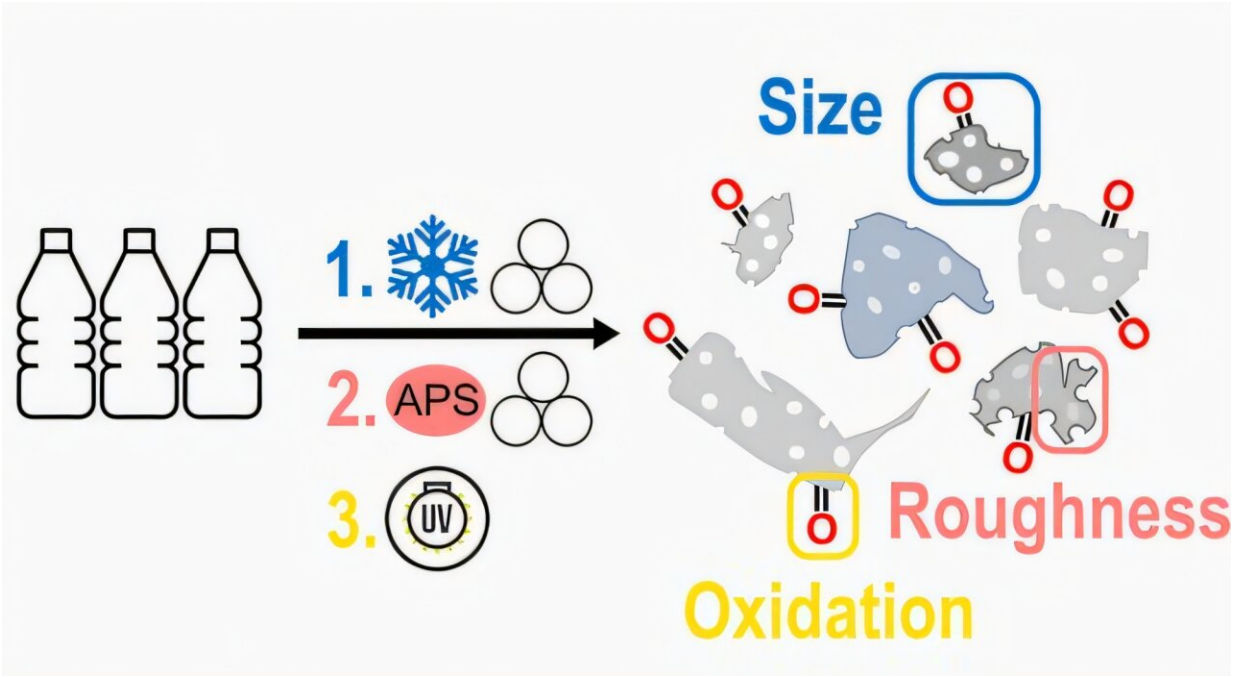

Credit: *Environmental Science & Technology* (2025). DOI: 10.1021/acs.est.5c02872

McGill University researchers have developed a novel method to replicate four types of microplastics commonly found in the environment, providing researchers with a standardized approach to study their toxic effects.

"We regularly see news about microplastics in our bodies or the environment. While this news is scary, we have yet to fully comprehend their effects in these places," said Audrey Moores, Professor in the Department of Chemistry and co-author of the paper published in *Environmental Science and Technology*.

"We are still very far from any quantitative understanding of what it means to have microplastics in all these places. Consequently, it's really critical for public policy development that we develop a standardized platform for testing their toxicity," Moores added.

McGill Ph.D. Candidate Jasmine Hong is the paper's lead author. Subhasis Ghoshal, Professor of Civil Engineering, co-supervised the research.

The struggle to find—or make—uniform samples

Scientists have struggled to obtain or create standardized microplastic samples. Environmental collection is costly and complicated, often yielding a mix of plastic types. Makers of samples in the lab have been unable to control their size, roughness and surface chemistries precisely enough, factors that are crucial to understanding toxicity.

The researchers' method addresses those gaps with nano-level precision.

"Researchers have made microplastics in the lab, but we were still missing a method that would allow us to make specific sizes of microplastics with desired surface chemistry and roughness. These parameters are critical because we know that they are key in determining the toxicity of nanomaterials," Moores said.

Their approach also produces smaller microplastic samples than typically seen in lab settings, which Moores said is vital for toxicological analysis.

A three-step recipe for replication

The teams used a three-step approach to fabricate the microplastics. First, cryomilling, or grinding particles under cold temperatures, allowed them to control size and to make smaller particles. Second, they exposed the particles to UV light, which helped them control surface oxidation. Third, they used a chemical reaction to roughen the plastics' surface.

The result is a clear, reproducible strategy for creating microplastics in the lab.

"We did a very in-depth analysis to really understand how to make the smallest copies, which are harder to make. Particle size is a key feature defining how microparticles can interact with organs. The smaller the particle, the more effects it can have," Moores said. "This will allow us to test for toxicity in a much more standardized fashion to truly understand the effects of microplastics."

Ph.D. candidate Jasmine Hong is already working on next steps. "I want to use these models to test how microplastics interact with other pollutants or toxic compounds," she said.

More information: Jasmine Hong et al, Accelerated Weathering of Microplastics: A Systematic Approach to Model Microplastic Production, *Environmental Science & Technology* (2025). DOI: 10.1021/acs.est.5c02872

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