

7 January 2025

Beatriz Santos

Scientists remove brominated flame retardants from e-waste ABS

The study addressed the challenge of recycling acrylonitrile butadiene styrene (ABS) plastics contaminated with TBBPA



ABS is one of the most commonly used plastics in electronic devices, accounting for an estimated 30% of e-waste

Researchers at Nanyang Technological University (NTU) Singapore have developed a method to extract brominated flame retardants (BFRs) from plastic electronic waste (e-waste).

BFRs, and particularly tetrabromobisphenol A (TBBPA), are commonly added to plastics to reduce their flammability and prevent the rapid spread of fire. They are also toxic, persistent, and bio accumulative, posing environmental and health risks.

The study addressed the challenge of recycling acrylonitrile butadiene styrene (ABS) plastics contaminated with TBBPA. ABS is one of the most commonly used plastics in electronic devices, accounting for an estimated 30% of e-waste.

The scientists explored three extraction methods: microwave-assisted extraction (MAE), ultrasound-assisted extraction (UAE), and dissolution-precipitation (DR). The team aimed to optimise the removal of TBBPA while preserving the quality of recovered plastics.

They used three ABS samples from two wireless routers (black and white) and a white paper shredder.

Results show that a mixture of solvents 1-propanol and heptane can dissolve the TBBPA whilst recovering over 80% of the ABS plastic.

MAE emerged as the most efficient method, achieving up to 95.81% TBBPA removal with over 80% recovery of clean ABS. UAE achieved similar removal rates but slightly lower plastic recovery. DR achieved the highest removal efficiency (98.15%) but at the cost of reduced plastic recovery and altered material properties.

Post-extraction analysis showed that MAE-treated plastics retained physical and thermal properties comparable to virgin ABS, ensuring their usability in recycling.

The researchers hope that their method will facilitate the recovery of clean plastic and increase the recycling of e-waste plastic.

They shared their findings in 'Enhanced extraction of brominated flame retardants from e-waste plastics', recently published in *Chemical Engineering Journal*.

<https://www.sustainableplastics.com/news/singapore-scientists-remove-flame-retardants-electronic-waste>