

Improving Australia's plastic waste recycling rates with concrete solutions

Providing micro and nano fabrication facilities for Australia's researchers, students and industry

Seeking smarter and safer ways to support Australia's circular economy, a team of local researchers have identified a novel method to modify the surfaces of recycled plastic waste material, for repurposing in concrete production.

Mahmoud Abu-Saleem, a Masters by Research candidate at the University of South Australia, has been investigating how the concrete industry can contribute to Australia's national waste policy action plan by reusing some of the 3.4 million tonnes of plastic waste produced annually.

Working under the supervision of Professor Yan Zhuge, Dr Reza Hassanli, Dr Md Mizanur Rahman, Mark Ellis and in collaboration with the City of Salisbury, Mahmoud developed a microwave radiation pre-treatment process that would modify the surfaces of the recycled plastic (Polyethylene Terephthalate, High-Density Polyethylene and Polypropylene) without compromising the concrete's strength.

However, the effects from treating the plastic surface using microwave radiation were not visible and Mahmoud had no way to evaluate his study - until he connected with the South Australian node of the Australian National Fabrication Facility (ANFF-SA).

"ANFF-SA provided the sessile drop optical contact angle measuring system and testing expertise for me to obtain a final analysis of the testing measuring results," said Mahmoud.

"They were friendly, knowledgeable, facilitated the task and saved me time by helping to make it happen - on campus and without complexity - which couldn't have been achieved elsewhere."

Mahmoud's research indicates that microwave radiation pre-treatment is a good surface treatment method. The compressive strength testing increased by 10 percent and the scanning electronic microscope images confirmed strong contact

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between the treated plastic aggregates and cement paste mix.

"The opportunity to mix recycled plastic waste into concrete production demonstrates how industry and researchers can work together to actively contribute to Australia's plastic waste management plan," said Mahmoud.

These exciting results lay the foundation for future studies including assessing the microwave radiation process on other plastics individually, evaluating different radiation frequencies, exposure duration and experimenting with other mechanical and durability properties.

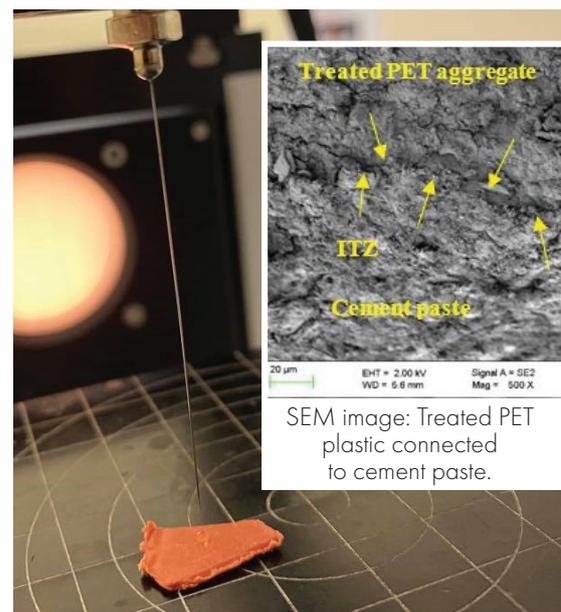
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nanofabrication facility providing access to cutting-edge equipment and a team of qualified experts.

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If you would like support with your next project, please contact ANFF-SA today on 08 8302 5226 or email [simon.doe@unisa.edu.au](mailto:doe@unisa.edu.au).



South Australian Node of the Australian National Fabrication Facility

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