
Dr. Balaji


Dr.Kamyar Shirvani Moghaddam & Prof. Minoo Naebe

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

Leveraging sustainable plastic parts for the future of the automative industry

Eco-friendly material advancements are steering innovations in the automotive industry.

Electric vehicle's (EVs) are helping to combat climate change but their limited performance compared to traditional combustion engine vehicles is contributing to a consumer adoption barrier. An essential way to increase efficiency and extend the average driving range is lightweight structural components.

Traditionally, this has been achieved by using polymer composites which present challenges of low mechanical properties and material circularity.

A potential cost-effective and sustainable solution has been found by a team of researchers at Deakin University, led by Dr Balaji, Dr Kamyar Shirvani Moghaddam & Prof. Minoo Naebe. Their research uncovered a lightweight hybrid material (patent pending); polypropylene reinforced with the fibres from basalt, a naturally occurring mineral, and Magnesium oxysulfate (MOS).

"The synergy of Basalt fibres and MOS are revolutionising the flexural properties of hybrid composites, rejuvenating their impact strength at room temperature and surpassing the low temperature impact prowess of neat polypropylene," stated Dr Kamyar Shirvani Moghaddam.

"The most exciting aspect of our work involved characterising the composites" explained Dr Kamyar Shirvani Moghaddam. The results confirmed that the "manufactured hybrid composites in this project offer enhanced mechanical properties, improved impact performance, and increased sustainability, making them a promising choice for the automotive industry for high-demand applications like battery top covers and cross car beams - pioneering a new era of sustainable design."

> "ANFF-SA provided us quality characterization results that were useful in understanding and tuning the composite microstructure."
> **Dr Kamyar Shirvani Moghaddam.**

This was achieved utilising MicroXCT-Zeiss Xradia 400 at the South Australian node of Australian National Fabrication Facility (ANFF-SA) at the University of South Australia's Mawson Lakes campus.

Kamyar says that the quality characterisation support from ANFF-SA expert, Dr Iliana Delcheva, assisted their understanding and tuning the composite microstructure. "Iliana demonstrated excellence in this area that we strongly recommend to other researchers," praised Kamyar. "The cutting-edge micro–X-ray CT analysis unveiled the secrets of residual fibre length, ensuring a robust fibre-matrix interplay."

The strong support provided by ANFF-SA on this project and new research opportunities means this is just the beginning. "We have started our partnership with ANFF-SA on this project and will take up joint projects in the future," said Kamyar. "This research opens new opportunities to test the adaptability and verify the actual fibre content in composites, ensuring the integrity of the composite structure. This knowledge can be leveraged to predict performance in untested conditions, paving the way for more robust and adaptable material applications."

ANFF-SA is a world-class micro and nanofabrication facility providing open access to cutting-edge equipment housed in state-of-the-art facilities with support from world-leading experts.

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