ANFF-SA

Electrochemical research leads to green polymer breakthrough.

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

Researchers exploring the emerging field of electrochemistry at Flinders University have used electricity to generate a valuable green polymer for producing highly functional and environmentally sustainable materials.

The discovery of the unique polymer signifies a crucial milestone in advancing the production of new chemicals and materials. Utilising an electrically-driven approach that can be powered by renewable energy, the technique also yields significantly less waste compared to conventional processes.

Dr. Thomas Nicholls, a Research Associate at the Flinders University College of Science and Engineering, said support from the South Australian Node of the Australian National Fabrication Facility (ANFF-SA) has been invaluable to his project's success.

"Access to ANFF-SA's electrochemical characterisation equipment enabled the in-depth characterisation of the monomer starting materials," said Thomas.

"This helped us to determine the optimal conditions for the polymerisation process and enabled real-time monitoring of the reaction's progress."

The activation of the pivotal building block, known as a monomer, was achieved by the team introducing an electron to effectively "electrocute" the monomer, creating a chain reaction with another building block and generating a novel polymer.

"The reaction happens quickly, and it occurs at room temperature." said Thomas. "With no dangerous chemical initiators involved and electricity as the only catalyst, our process provides the versatility for a wide range of chemicals and materials to be produced in a more sustainable manner."

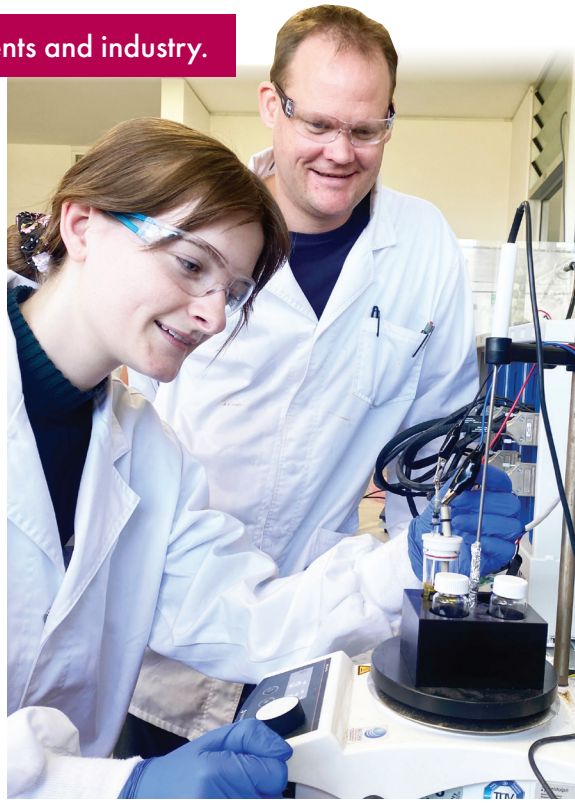
The high sulfur content of the novel polymer make it ideal for binding precious metals, such as gold, which presents valuable applications for the mining industry and e-waste recycling.

The polymer also boasts distinctive properties that enable sulfur-sulfur bonds to be broken and reformed, introducing an innovative recycling solution that surpasses the limitations of traditional plastic recycling.

> "Access to ANFF-SA's electrochemical characterisation equipment enabled the in-depth characterisation of the monomer starting materials."
>
> **Dr Thomas Nicholls, Flinders University.**

"Unlike conventional methods that may lead to degradation and down-cycling, our polymer can be chemically converted back into its building blocks with remarkable efficiency," said Thomas.

"Our quantum mechanical calculations have unveiled a self-correcting mechanism during polymerisation, ensuring a consistent and uniform structure that is unprecedented for high sulfur content polymers."



The potential applications for the unique polymer span environmental remediation, gold mining, and use as an anti-microbial agent.

Located at Flinders University's Bedford Park campus, ANFF-SA's electrochemical characterisation laboratory is a crucial resource for multiple research groups who are currently engaged in a broad range of projects and the facility's cutting-edge equipment and expertise play a vital role in facilitating synthetic electrochemistry research by leading academics and industry.

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.

If you require support or assistance with your current project or upcoming research, please contact us today on 08 8302 5226 or visit anff-sa.com.

South Australian node of the Australian National Fabrication Facility
University of South Australia, Mawson Lakes, SA, 5095 +61 8 8302 5226