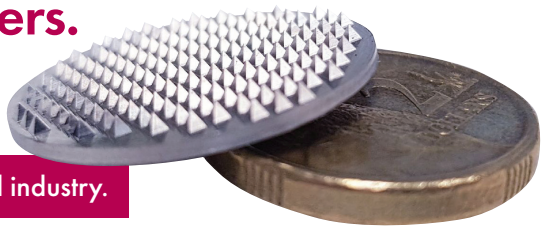
ANFF-SA

Advanced microplasma reactor technology transforming green hydrogen or air into sustainable fertilisers.



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

A pioneering team of researchers have leveraged precision engineering capabilities to develop a novel technology for sustainably converting green hydrogen into ammonia or air into nitrates to make customised fertilisers.

Undertaking critical research into energy intensification, Professor Volker Hessel, from the University of Adelaide's School of Chemical Engineering and the University of Warwick's School of Engineering, and his team have exploited a bespoke concept involving a uniquely designed microplasma reactor to produce sustainable customised fertilisers for Australian farmers.

The novel microplasma reactor was conceptualised by Volker's colleague, Professor Evgeny Rebrov and his coworker Dr Nima Pourali, also from the University of Warwick, who discovered they could optimise the plasma reactor's efficiency by bringing the electrode gaps to less than one millimeter and focusing energy on the tiny tips of the pyramid-shaped electrodes.

The tiny, yet stable charge point of each pyramid allows energy to spread around the reactor through intensified electric field zones making the conversion of green hydrogen or air more efficient. The process also significantly reduces energy consumption and emissions compared to traditional flat electrodes.

Volker said the first fully functional prototype was crafted using the exceptional advanced precision engineering skills and capabilities available at the South Australian Node of the Australian National Fabrication Facility (ANFF-SA), situated at the University of South Australia's Future Industries Institute.

"During its development phase my colleague made several unsuccessful attempts to have the microplasma reactor fabricated overseas, so I contacted ANFF-SA as I knew they'd make it work and they didn't let me down," said Volker.

"ANFF-SA meticulously machined one-millimeter-high pyramid electrodes to a height accuracy of 1µm on the surface of our micro reactor which has tremendously transformed our energy intensification processes."

Volker said having his device machined locally by world-leading microfabrication experts has saved his research team significant time and costs during their experimental work, while increasing project output and innovation.

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>
> **Prof Volker Hessel, University of Adelaide.**

He commends ANFF-SA's collaborative project management approach.

"ANFF-SA is not only a great network - it's also an outstanding scientific community with a genuine understanding of what researchers really need," said Volker.

"The ANFF-SA team possesses qualities that are beyond monetary value. Their commitment to knowledge sharing, expert advice and state-of-the-art equipment has resulted in the swift delivery of a high-quality micro reactor that not only precisely meets our needs but truly exceeded my expectations."

In harnessing the power of this remarkable technology, Volker and his team are sustainably converting green hydrogen into ammonia and air into nitrates to deliver customised fertilisers to South Australian farmers, but the versatility of the pyramid microplasma reactor makes it suitable for many valuable applications.

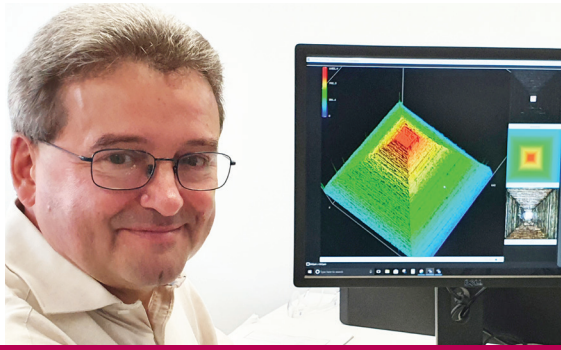
"Agriculture is one critical application for our microplasma reactor which will help address pressing environmental issues and create a more sustainable future," said Volker. "We are also working on other important conversions like carbon dioxide to methane and C2+ but our device could be utilised for any kind of chemical nitrogen-fixation, including the production of fertiliser for use in space."

ANFF-SA Director, Professor Craig Priest, is thrilled his team have contributed to the successful development of the novel pyramid microplasma reactor.

"ANFF-SA plays a pivotal role in supporting world-leading researchers like Prof Volker Hessel develop cutting-edge technologies. This is yet another example of our equipment, facilities and expertise unlocking ground-breaking innovations that promise a green and efficient future," said Professor Craig Priest.

Located at the University of South Australia and Flinders University, 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.

For further information please phone 08 8302 5226 or visit anff-sa.com.



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