

## CASE STUDY

### DR RHIANNON CHALMERS-BROWN

RICE Research Assistant - Low Carbon Bioprocess Analysis



I completed my undergraduate degree in Chemistry at USW, I was then encouraged by my research supervisor, Prof Richard Dinsdale, to apply for the KESS 2 scholarship as I had a keen interest in renewable energy and the environmental sector in general.

The steel industry is thought to be the world's largest industrial contributor to atmospheric carbon dioxide yet the British steel industry contributes approximately £9.5 billion to the UK economy every year. Steel is a key material for the construction and delivery of renewable energy sources such as wind, hydroelectric and solar power, with the construction of one wind turbine requiring up to 230 tonnes of steel. It is imperative that the steel manufacturing process is made more environmentally friendly whilst remaining cost effective and efficient so that steel production becomes sustainable during the inevitable shift to green technology and enterprise.

Gareth Lloyd from Tata Steel said "It was very satisfying to work with Rhiannon, from generating the initial idea with University of South Wales, then recruiting and working with Rhiannon through the initial successful lab work, to the design and deployment of a proof-of-concept pilot plant at Port Talbot which hopefully will lead to improving both the environmental and financial sustainability of steel manufacturing in Wales."

Rhiannon's Director of Studies, Professor Richard Dinsdale, said "This was an important and challenging project which addresses the pressing need for carbon capture and reuse technologies which can be deployed not only in Wales but globally. Rhiannon worked hard in collaboration with her industrial partners to identify a potential solution which we are seeking to implement in South Wales."



(Above) Rhiannon's award winning Research Image entry, which was hand-painted, for the KESS 2 Annual Event in 2018.

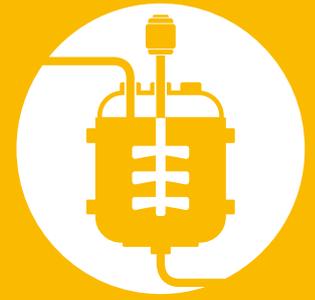
Working with TATA enabled me to become familiar with the barriers faced by large companies when trying to reduce their impact on the environment. TATA are proactive in their approach to finding solutions to huge problems such as carbon dioxide emissions which made collaboration with them both easy and enjoyable. I had so many fantastic opportunities and experiences but a highlight for me was a full site tour from start to finish of the steel manufacturing process. It's encouraging to know that companies do want to make these changes. The next big challenge is implementing them before it is too late.

KESS 2 sustains a culture of understanding and camaraderie shown through the excellent support from both the staff behind the scenes and fellow KESS 2 students. I have made some great friends over the 3 years and look forward to watching them all succeed.

# IMPACT

My research developed a biorefining process to take greenhouse gas emissions and convert them to chemicals for use in biopolymers and plastics. Climate change is said to be one of the main drivers of worldwide species extinction, leading to loss of biodiversity and the collapse of stable ecosystems. This directly impacts humans, threatening our food resources, clean water and air.

The bioreactor is now at pilot scale with the potential to develop into an affordable technology to bridge the gap between the steel industry as we know it and a sustainable future in green steel manufacture.



## KESS 2 PARTICIPATION HIGHLIGHTS:



Over the course of my PhD I had many highlights and achievements, such as attending the KESS 2 Transnational Grad School twice, once to Bangor and then to Pardubice in the Czech Republic. As well as this I got to take part in the Soapbox Science event in 2017 in Cardiff and also attended a writing and communication course in mid-Wales.

In December 2019 I successfully completed the NEBOSH Environmental management course and passed the examination, setting me ahead of the game for potential roles and helping me to stand out to future employers.



Through the KESS 2 programme I was able to present my work at the annual event three years running and won the following awards: The Sustainability Award, 2017; Best Research Image Award, 2018 and the Best Presentation Award, 2019. I was also able to present my research at the International Water Association Anaerobic Digestion conference in Delft on 25th June 2019.

## PUBLICATIONS

Overcoming nutrient loss during volatile fatty acid recovery from fermentation media by addition of electro dialysis to a polytetrafluoroethylene membrane stack : <https://doi.org/10.1016/j.biortech.2019.122543>

Knowledge Economy Skills Scholarships (KESS 2) is a pan-Wales higher-level skills initiative led by Bangor University on behalf of the HE sector in Wales. It is part-funded by the Welsh Government's European Social Fund (ESF) convergence programme for West Wales and the Valleys. For further information about how your organisation could benefit from participating in KESS 2, please contact the KESS 2 Central team at Bangor at: [kess2@bangor.ac.uk](mailto:kess2@bangor.ac.uk) or the USW KESS 2 team at: [kess@southwales.ac.uk](mailto:kess@southwales.ac.uk).

The USW KESS 2 team is based within Research and Innovation Services (RISe), part of Research and Business Engagement. RISe is a dedicated team providing specialist support for Research Infrastructure; Postgraduate Research Support; Research Impact; and Income Generation. Visit: <http://research.southwales.ac.uk/>

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