The 103rd GREEN Seminar

Common challenges in electrochemistry: from the production of green hydrogen and ammonia to batteries and back

Chair: Dr. Shoichi Matsuda (GREEN)

Prof. Ifan E. L. Stephens

(Imperial College London, UK)

Electrochemistry will play a pivotal role in our transition away from fossil fuels to a net zero society. While batteries and fuel cells are set to decarbonise transportation, electrolysers can enable the sustainable synthesis of our most coveted chemicals, such as H2 and NH3. It turns out that some of the reactions that we aim to accelerate in water electrolysis, such as H2 evolution, are exactly the reactions that we wish to inhibit in Li ion batteries and during N2 reduction. To that end, in our group we translate techniques and insight from electrosynthesis to battery science and vice versa.

I will present our mechanistic studies on the electrocatalysis of (i) O2 evolution for water electrolysis on iridium based oxides1,2 and (ii) N2 reduction to NH3 in organic electrolytes3-5 (iii) parasitic gas evolution in Li ion batteries.

Our studies incorporate electrochemical measurements, electrochemical mass spectrometry, operando optical spectroscopy, secondary ion mass spectrometry, cryo electron microscopy, x-ray photoelectron spectroscopy and density functional theory; using the combination of these techniques, we build a holistic picture of the factors controlling these technologically critical reactions.

Venue: Rm. 409/410, 4F, Collaborative Research Bldg., Namiki-site

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Contact: MATSUDA.Shoichi@nims.go.jp