Turning CO_2 into energy storage media in efficient High Temperature Electrochemical Membrane Reactors

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Presentation Preference: Oral

Career Level: Career Scientist (>8 yrs post PhD)

Aligned with Science Focus: CO_2 utilisation, methanol or hydrogen economy, electrochemical catalysis, solar fuels, general catalysed processes, renewable energy storage

Abstract:

The utilisation of CO_2 from several industrial processes and power generation plants is considered as one of the most disruptive emerging energy technology areas. Although, waste CO_2 is easily available, only few industrial processes currently utilise this CO_2. High temperature (600-800°C) electrochemical membrane reactors (electrolysers) integrated with solar PV and thermal concentrators provide highly efficient way to convert mixture of CO_2 and water (steam) into syngas. The syngas can be further converted into liquid fuels ready for storage or transport to other locations. As this technology enables direct integration of the renewable energy sources (RES) to the electrochemical reactor, it effectively turns CO_2 into a renewable energy storage medium. Such a technology is of particular interest for the regions where abundant renewable energy is available along with CO_2. In this presentation a brief overview of this technology will be presented. The preliminary experimental results on the CO_2 – steam conversion to syngas in tubular solid oxide electrolyte reactors using novel perovskite type catalysts developed at CSIRO will also be presented along with the process efficiency and CO_2 conversion rates.

Biographical Statement

Dr Kulkarni is a Research Scientist and currently the project leader for CSIRO's 'Electrochemical Conversion of CO_2' project. He has several years' experience working on solid state electrochemical devices and supported metal catalysis, and has relevant experience in material synthesis, characterisation and reactor design and testing. Dr Kulkarni obtained his MS and PhD from the New Mexico Tech and Los Alamos National Laboratory in the United States and joined CSIRO in 2009. He has been working on fundamental and technological aspects of electrochemical energy devices and materials throughout his research career, which includes academic research as well as full-time professional employment in the R&D departments of Cabot Corporation (United States) and Atlas Copco. He has authored or co-authored more than 34 technical publications including patent applications with more than 750 citations.