Introduction to CO_2 Capture

The generation of carbon dioxide is a direct consequence of extracting the maximum energy possible from fossil fuels. However, emissions of CO_2 to the atmosphere can be avoided by returning the carbon to the lithosphere. At sufficient purity, CO_2 can be injected into the subsurface for permanent storage (see section 2.5 of this report). However, because fuel conversion requires oxygen from the environment, at least one chemical separation must be performed to achieve the CO_2 purity required.

Carbon dioxide capture and separation is a costly and inefficient process using today's technology. At thermodynamic efficiencies of 15% - 25%, these unit operations can consume 10% - 20% of a power plant's output, and their use is predicted to raise electricity generation costs by over 30%. There is significant opportunity to exploit fundamental advances in chemistry and engineering to drive down the operational penalties that CO_2 capture imposes on power production.

GCEP has one project in the area of carbon capture and separation that recently received approval for another three years of funding to allow the researchers to make further progress following on from their previous work.

Yuichi Fujioka is leading a team of scientists at The Research Institute of Innovative Technologies for the Earth (RITE) in developing CO_2-selective membranes. By engineering the chemistry and morphology of such membranes at the nanoscale, the group has made significant improvements to membrane performance. Future work will involve evaluating various methods for membrane preparation and solubility performance in supercritical CO_2.