

## **Project 2: Carbon dioxide as alternative carbon source using active membrane materials**

**HOME INSTITUTION:** RWTH Aachen Germany. Supervisors of the PhD student in Aachen: Prof. Walter Leitner.

**HOST INSTITUTION 1:** Università di Messina, Italy. Supervisor of the PhD student in Messina: Prof. Siglinda Perathoner

**HOST INSTITUTION 2:** CAT Catalytic Center (Dr. Thomas Muller)

### **PROJECT DETAILS**

The project will investigate supported ionic liquid phase materials (SILP materials), where the catalyst can reside homogeneously dissolved in a thin film of ionic liquid on a porous support. The molecular design of the ionic liquid allows influencing the adsorption/solubility of gas and product on this material and can thus directly impact on the chemical conversion.

The catalytically active centers are chosen to be relevant for the chemical reactions of CO<sub>2</sub> that are currently followed here at ITMC at RWTH Aachen. This includes in particular the cycloaddition of epoxides and CO<sub>2</sub> to form cyclic carbonates, the carboxylation of C-H bonds by formal insertion of CO<sub>2</sub>, and the hydrogenation of CO<sub>2</sub> to formic acid. New materials will be tested for these reactions using reactor equipment and analytical methods that are available in our laboratories. Wherever possible, the experimental results will be coupled to computational analysis of reaction mechanisms by DFT calculations. Simulations & calculations will be performed at a partner university.

Our student are also invited to use the analysis capabilities at the associated partner "CAT-Catalytic Center", in particular the analysis tools for complex reactions networks, including *in-situ* and *on-line* monitoring to identify new methods for selective, green processes.