

**Proposed PhD subject in the frame of SINCEM (a proposal to the EU Erasmus Mundus Joint Doctorates EMJD program to create an International joint Doctoral School in Sustainable Industrial Chemistry):**

**PhD subject: “Maximizing the Chemical Value of CO<sub>2</sub> from Carbon Capture”**

**Summary:** This project addresses a particularly important topic. Carbon Capture is one of the primary technologies proposed to mitigate climate change. However, Carbon Capture is energy intensive and the captured CO<sub>2</sub> is currently considered to be a waste. This PhD project aims to change that view completely by giving CO<sub>2</sub> chemical value. The research programme is a partnership between two internationally leading research groups who have worked together for many years. At **Nottingham**, you will be developing ways of using the captured CO<sub>2</sub> as a solvent for continuous chemical reactions, thus benefitting from the energy that has already been used to compress the CO<sub>2</sub> when it was captured (see page 46 of *Big Ideas for the Future* <http://www.rcuk.ac.uk/documents/publications/BigIdeasfortheFuturereport.pdf>). At **Aachen**, you will be using CO<sub>2</sub> as a feedstock, incorporating it into molecules thereby reducing the amount of petrochemical feedstock needed to make chemicals. The project will give you the chance to work on a wide range of chemistry and analytical techniques, will provide you with experience of the latest continuous reactors ([www.youtube.com/watch?v=ihKIfCJBQII&feature](http://www.youtube.com/watch?v=ihKIfCJBQII&feature)), will bring you into contact with industry, will let you work with both chemists and engineers, and will train you how best to carry out research and how to communicate your science to the world.

**Relevant Recent Publications:**

1. “Could the Energy Cost of using Supercritical Fluids be Mitigated by using CO<sub>2</sub> from Carbon Capture and Storage (CCS)? (J. G. Stevens, P Gomez, R. A. Bourne, T. C. Drage, M. W. George and M. Poliakoff) *Green Chem.* (2011) 13, 2727-2733.
2. “Self-Optimizing Continuous Reactions in Supercritical Carbon Dioxide” (A. J. Parrott, R. A. Bourne, G. R. Akien, D. J. Irvine and M. Poliakoff) *Angew. Chem. Intl Ed.* (2011) 50, 3788-3792 (hot article).
3. “Worldwide innovations in the development of carbon capture technologies and the utilization of CO<sub>2</sub>” (P. Markewitz, W. Kuckshinrichs, W. Leitner, J. Linssen, P. Zapp, Petra, R. Bongartz, A. Schreiber T. E. Mueller), *Energy. Environ. Sci.* (2012) 5, 7281-7305

**Supervisors of Thesis: Professors M Poliakoff CBE FRS and MW George**

**Location: The University of Nottingham (UK);** the School of Chemistry was rated No. 2 in the UK for research quality in the most recent Research Assessment Exercise. Our research group is one of the leading groups for supercritical research in the world; [www.nottingham.ac.uk/supercritical](http://www.nottingham.ac.uk/supercritical) and [www.periodicvideos.com](http://www.periodicvideos.com)

**Partners:**

**RWTH Aachen (Germany).** Full partner. Co-Supervisor of Thesis: **Professor Walter Leitner**; Aachen is a major centre for Green Chemistry with special expertise in homogeneous catalysis in supercritical CO<sub>2</sub> and use of CO<sub>2</sub> as a feedstock.

[www.tc.rwth-aachen.de/aw/cms/TC/Zielgruppen/~vft/prof\\_leitner/?lang=en](http://www.tc.rwth-aachen.de/aw/cms/TC/Zielgruppen/~vft/prof_leitner/?lang=en)

**CAT Catalytic Center (Germany)** - Associate partner candidate. CAT is an industrial consortium and EU leader in developing processes based on CO<sub>2</sub> and will provide experience of working on the industrial implementation of CO<sub>2</sub>-based chemistry; [www.catalyticcenter.rwth-aachen.de/](http://www.catalyticcenter.rwth-aachen.de/)