

Citation: Professor Michael Claeys – Department of Chemical Engineering

Professor Michael Claeys holds undergraduate and doctoral degrees in Chemical Engineering from the Karlsruhe Institute of Technology in Germany. In 1998 he joined the Catalysis group at the Department of Chemical Engineering at UCT as a post-doctoral fellow and he has remained with this group ever since, as a Senior Research Officer, Associate Professor and Professor (since 2010). His research is strongly focused on the development of new catalysts in energy applications with emphasis on synthesis gas conversion (Fischer-Tropsch synthesis) and CO₂ valorization for the production of synthetic fuels and chemicals.

Prof Claeys is highly recognized internationally for his work using in-situ methods that he invented. These include an XRD reaction cell which can be attached to commercial X-Ray diffractometers and a worldwide unique magnetometer for the study of ferromagnetic materials such as cobalt, nickel or iron bearing catalyst which are often used in catalytic applications. Importantly, these methods allow to study materials at fully relevant industrial conditions in terms of high temperatures, pressures and reaction environment allowing to identify correlations between the catalyst structures and catalytic performance. "Catching catalytic reactions in the act" greatly facilitates the identification of catalyst deactivation mechanisms and preferable catalyst phases and has led, in many cases, to improvement of catalysts and strategies to avoid loss of catalyst performance. Both instruments have been patented and are extensively being used by Prof Claeys' students and by his collaborators. The XRD reaction cell has been fully commercialized by the UCT spin-off Cape Catalytix and is being distributed worldwide.

As a soft-funded researcher Prof Claeys has a strong focus on applied industrial research and postgraduate-training. Amongst the industry work conducted the close collaboration with Sasol stands out and the use of the magnetometer, which was developed under this partnership, has helped the company in various instances to improve their catalysts and optimize their processes. Professor Claeys has supervised over 60 postgraduate students and 15 post-doctoral fellows, and he is currently involved in the training of 19 postgrads. He has published over 120 journal articles, 3 book chapters and 22 patents, and presented over 40 invited, keynote and plenary lectures at international meetings. He has recently received an A2 NRF rating.

Apart from conducting his research Prof Claeys also plays an important leadership role in various national and international catalysis societies, committees and advisory boards. Importantly, since 2008 he is also the director of the South African DSI-NRF Centre of Excellence in Catalysis, known as c*change, where he also serves as the manager of the synthesis programme since the Centre's inception in 2004. Under his leadership the Centre has established a strong national catalysis network with a current membership 25 researchers from 11 higher education institutions in South Africa, 50 to 60 postgraduate students and 15 postdoctoral fellows. The Centre of Excellence works in large multidisciplinary teams on issues which are of key importance to the South African chemical industry with programmes on synthesis gas conversion, paraffin and olefin upgrading. As of recently the Centre concentrates on catalytic approaches for CO₂ activation using various catalytic approaches. This includes the production of fuels from CO₂ and green hydrogen derived from renewable energy, a multistep process often called power-to-liquids, in which the Fischer-

Tropsch reaction as researched by Prof Claeys and his team plays a key role. To date c*change has graduated over 180 MSc and PhD students and published over 350 journal papers. It also has a strong transformation record with more than 50% of the recent graduates being female and more than 70% black. The Centre enjoys international recognition in particular through reputation of Prof Claeys' Synthesis Gas Programme, which runs its own international conference series, the Syngas Convention (2012, 2015, 2018).