HIGHLIGHT # 2 – PARAFFIN ACTIVATION PROGRAMME

The relevance of catalysis to the South African economy and the opportunity of catalysis for the South African economy are briefly described below.

The c*change scientific programme is made up of three distinct research programmes, viz.

1. The Synthesis Gas (SYN) Programme (cf. Highlight # 1)
2. The Paraffin Activation (PAR) Programme
3. The RSA Olefins (OLE) Programme (cf. Highlight # 3)

South African Context

As opposed to changing the selectivity during the Fischer-Tropsch reaction itself (cf. Highlight # 1), the primary objective of the Paraffin Activation Programme is to add value to the relatively inert or inactive paraffin fraction derived during the Fischer-Tropsch synthesis process, currently used mostly in low-value fuels and solvents. To activate paraffins (i) an oxygen-containing functional group needs to be selectively introduced into the carbon backbone, preferably at the primary carbon position, and/or (ii) internal double C=C bonds need to be introduced selectively into the carbon backbone. The activation of paraffins is being addressed through three technologies: bio-catalysis, homogeneous catalysis and heterogeneous catalysis. The studies are centred on developing learning from highly efficient biological catalyst designs to be utilized in a biomimetic approach to improve the efficiency of the process, with adaptation to homogeneous and heterogeneous catalytic routes expected to be more economically and industrially feasible.

Impact of the Paraffin Activation Programme

This work is geared towards adding value to the RSA chemical product pool (see below).

A major objective has been to provide proof of concept for a new commercial process for alkane activation in context of the targets determined for a feasible process.

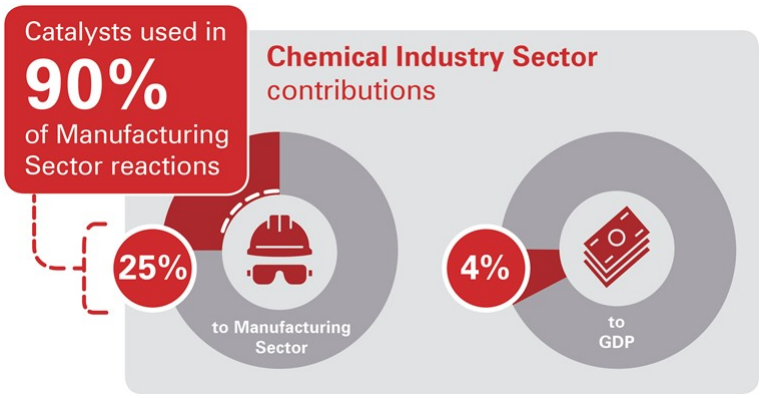
Significant progress has been made to deliver improved fundamental understanding of catalysis for alkane activation at the molecular level in order to facilitate more targeted research aimed at overcoming technical hurdles to achieve a commercially viable system.

Initiating this difficult, previously under-explored research area would not have been feasible without long-term support to overcome the extended study durations necessary and has been reliant on the multi-disciplinary and multi-institutional collaborative network made possible by the Centre of Excellence programme.

Relevance of Catalysis to the South African Economy

By its very nature the field of catalysis is environmentally friendly, insofar that catalysis inherently aims to improve the selectivity and yield towards the formation of the desired product(s), thereby reducing the formation of the undesired by-product(s). Moreover, relatively small changes in the desired product yield from a catalytic process (± 1%) may translate into substantial economic benefits for an industrial chemical process. Consequently, there is great potential for indirect economic benefit from the research, in that the research supports the South African Chemical Process Industry (SACPI) by studying more efficient chemical transformations, resulting in economically more competitive chemical processes.

Catalysis lies at the heart of the many chemical transformation processes, because approximately 90% of all chemical reactions carried out in commercial chemical industries make use of a catalyst. The purpose of a catalyst is typically to (i) speed up the rate at which the desired product is formed, (ii) form the desired product more selectively, and/or (iii) lower the operating conditions for the reaction. All three of these aforementioned reasons result in improvements of the chemical process and, consequently, in the overall financial performance of the company.



The RSA chemical industry sector contributes about 25% to the RSA manufacturing sector, and this contributes about 4% to GDP.

Opportunity of Catalysis for the South African Economy

South Africa is a nett importer of chemical products. The opportunity for the South African Chemical Process Industry is therefore to reduce the trade deficit by (i) increasing the volume of locally manufactured chemical products and reducing imports, or (ii) by adding value to the locally manufactured chemical products, particularly those that are exported.

The c*change research portfolio is geared heavily towards supporting the South African Chemical Process Industry in achieving those objectives.