

High Throughput Catalyst Development

At a glance

With the predicted decline in traditional hydrocarbon production and use, alternative sources of liquid fuels for transport and other applications will be required. A number of catalysed reactions can be used to produce suitable fuels and are of industrial interest..

The project developed a novel high throughput methodology (Liverpool), where potential catalysts were screened for long term stability and other desirable properties, with the “hits” being scaled up for more detailed characterization (Johnson Matthey), and suitable catalysts produced using a novel green production technique (Cardiff).

Challenge

Existing catalysts for clean fuel production are well developed but can suffer from problems including shorter-than-desired lifetimes and low selectivity. The discovery process can also be slow and hinder the rate of introduction of new products.

Development of new catalysts is also hampered by the difficult reaction conditions and the need for extremely long testing times to assess long term stability, as well as the inherent difficulty in predicting ways to improve catalysts.

Approach

High throughput techniques for synthesis and characterization of catalysts were developed at Liverpool in order to rapidly identify potentially useful materials from a large search space, while Cardiff developed a supercritical CO₂ antisolvent process, which is a potential green production route.

Larger amounts of materials identified at Liverpool were produced and subjected to thorough characterization and testing at Liverpool and Johnson Matthey. These results informed the choice of target materials at Cardiff.

Solution

A stability screen was developed whereby arrays of potential catalysts were treated under simulated reaction conditions, and their stability measured using XRD. High throughput TGA was used to provide other useful information about the materials.

A wide range of materials were screened and several interesting lines of enquiry were pursued further at all three centres.

Benefits

Several interesting groups of materials were discovered, leading to further investigations and, in some cases, patents are being acquired.

