

**CLOSING THE GAP BETWEEN HOMOGENEOUS AND HETEROGENEOUS
RUTHENIUM-BASED FISCHER-TROPSCH SYNTHESIS**

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Metals active for Fischer-Tropsch synthesis are iron, cobalt, ruthenium and nickel. According to Vannice [1] ruthenium is the most active catalyst. In order to “compete” with the less expensive metals it is therefore important to ensure maximum utilisation of ruthenium, i.e. maximum activity and stable operation. The highest metal utilisation or number of surface metal atoms is to be expected in small crystallites or clusters of ruthenium. In this study ruthenium crystallites of different size (2 to 9 nm) and narrow size distributions have been prepared using a reverse micelle technique. In order to extend the crystallite size range obtained with this technique ruthenium-organo-metallic clusters with defined numbers of ruthenium atoms (2 to 6) have been prepared. These clusters present model systems for ruthenium crystallites in the Angström range in which all atoms can be regarded as surface atoms, i.e. 100% dispersion. They can also be regarded as potential catalysts for a homogeneous Fischer-Tropsch reaction [2].

Both the nano-sized crystallites and the clusters have been deposited on alumina support material and tested for Fischer-Tropsch activity in a fixed bed reactor at 170°C. Preliminary results indicate that the metal-organic ruthenium clusters, although not stable at the reaction conditions applied, display some initial Fischer-Tropsch activity as higher hydrocarbons have been formed. On the basis of ruthenium surface atoms, the clusters were approximately as active as the smallest nano-sized crystallites tested. The activity of the nano-sized crystallites, however, increased with increasing crystallite size, an effect which had previously also been reported for cobalt [3,4] and iron [5] crystallites. The paper will also report on selectivity changes obtained with the different model catalysts.

References:

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