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Liquid phase oxidation of cyclohexane using supported novel metals: Catalytic oxidation or autoxidation?

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A study of the selective oxidation of cyclohexane has been performed using novel metallic catalysts supported on magnesium oxide and the reaction mechanism was investigated by means of spin trapping technique and EPR spectroscopy. Activity tests aimed to determine the conversion and the selectivity of supported mono-metallic catalysts showed that gold and other novel metals were capable of selectivity control to cyclohexanol formation up to 70%, but this was accompanied by a limited enhancement in conversion when compared to the reaction in absence of catalyst. In contrast, when radical initiators were used the catalyst exhibited activity comparable to industrial processes above 5% conversion, and still preserving high selectivity. By studying the free radical autoxidation of cyclohexane and the cyclohexyl hydroperoxide decomposition in presence of spin traps, we showed that nano gold particles were capable of an enhanced generation of cyclohexyl alkoxy radicals via the homo-cleavage of the O-O bond in cyclohexyl hydroperoxide. The enhanced activity of these supported novel metals for peroxide decomposition not only initiates further autoxidation, but also provides high selectivity to the required partial oxidation products. The catalytic performance of the novel metal catalysts can be attributed to its dual role as both a promoter and a catalyst for this oxidation reaction, which is definitely different from pure autoxidation pathway.

Biography

Xi Liu has completed his PhD from Fritz-Haber Institute in 2008 and postdoctoral studies from Cardiff Catalysis Institute. He is the Research Associate in Cardiff Catalysis Institute, an expert in alkane functionalization and bio-fuel synthesis. He has published more than 20 papers in reputed journals, including Science.

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