Heterogeneous Cu Catalysts in C-N & C-O Coupling Reactions

Numerous copper precatalysts such as homogeneous Cu(I) and Cu(II) metal-ligand complexes have been used in catalytic C-N and C-O coupling reactions. Few examples of heterogeneous catalysts exist and no study has addressed whether truly surface-catalyzed pathways are possible. Two classes of solid precatalysts, copper oxide nanoparticles (supported and homogeneous) and copper-loaded zeolites, are being developed towards this end.

Copper Catalyzed N-Arylation Reaction

Copper nanoparticles of different shapes (nanorods, spheres, etc) have been synthesized and their reactivity compared. The catalysts with different morphologies have different reactivity. Supported CuO nanoparticles act as recyclable heterogeneous catalysts.

Copper modified zeolites are also being used. The heterogeneity of the system is being assessed by shape-selective catalytic reactions (Figure 1), as leached, soluble copper should not lead to shape-selective catalysis. Kinetic results (Figure 2) along with elemental analysis data before and after the reaction support the hypothesis of heterogeneous catalysis.

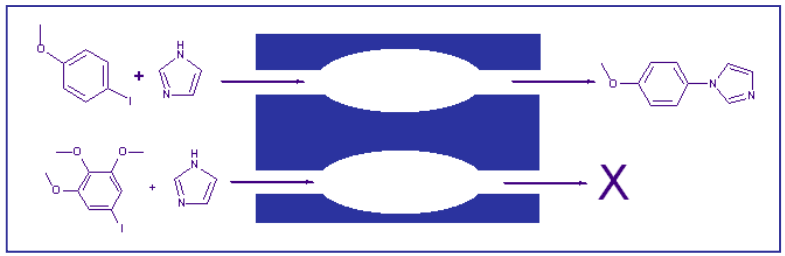

Figure 1: Zeolite Shape Selectivity Test

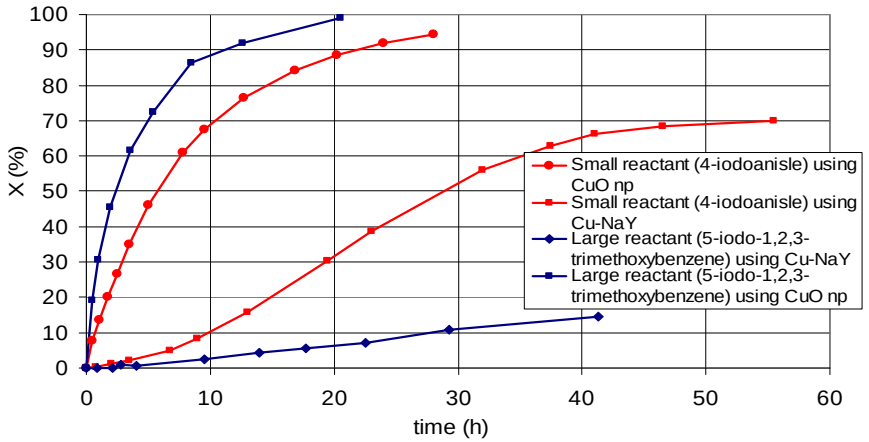

Figure 2: Cu-NaY shape selectivity test, and a comparison with CuO nanoparticles results

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