

Mechanism of action of silica aerogel catalyst functionalized with Cu(II)-cyclam complex

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An aerogel is a solid gel comprised of a porous solid in which the dispersed phase is a gas. [1] These compounds are in the focus of interest because of their special properties, such as high porosity, low density, large surface area and low thermal conductivity. However, their physico-chemical properties linked to their high surface area are still not fully investigated. [2] This study aims to evaluate the catalytic properties and the mechanism of action of a mesoporous Cu(II)-cyclam complex functionalized silica aerogel in the catalytic oxidation of phenol by hydrogen peroxide in aqueous medium.

We have synthesized a model Cu(II)-cyclam complex functionalized silica aerogel by the sol-gel method. The aerogel was characterized by IR, scanning electron microscopy (SEM), ICP-OES elemental analysis and N₂ gas adsorption-desorption porosimetry.

In order to benchmark the functionalized aerogel as a catalyst, systematic kinetic experiments were performed with the dissolved Cu(II)-cyclam complex, and parallelly, with the immobilized complex in the oxidation of phenol by hydrogen peroxide.[3] In order to understand the mechanism and create a kinetic model, the reactions were followed in real time by UV-Vis spectrophotometry (Figure 1). The results suggest that the mechanism of the oxidation of phenol changes with the immobilization of the Cu(II)-cyclam complex in silica aerogel. [4]

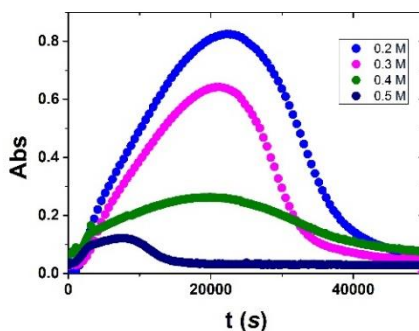


Figure 1. Catalytic oxidation of phenol followed by UV-vis at 400nm using different concentrations of H₂O₂ and dissolved Cu(II)-cyclam complex as catalyst. (5.0 mM phenol; 0.113 mg/ml Cu(II)-cyclam; 70 °C; pH = 3.5)

References:

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