



Cu-MCM-41介孔分子筛中不同价态铜上的吸附性能研究 Adsorption Behavior of Copper with Different Valences States in Cu-MCM-41

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中文关键词: [Cu-MCM-41](#) [介孔材料](#) [CO吸附](#) [C₂H₄吸附](#) [吸附量热](#) [红外光谱](#)

英文关键词: [Cu-MCM-41](#) [mesoporous materials](#) [adsorption of CO](#) [adsorption of ethylene](#) [microcalorimetric adsorption](#) [infrared spectroscopy](#)

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中文摘要:

合成了不同铜含量的Cu-MCM-41, 高温还原后仍具有良好的介孔结构。孔壁中的铜容易被H₂还原为Cu(0)。通过在氦气流中加热, 可以导致孔壁中的Cu(II)还原为Cu(I)。MCM-41中不同价态的铜具有不同的吸附性能: Cu(0)强烈吸附O₂, 吸附热高达427 kJ·mol⁻¹; Cu(I)在室温下几乎不吸附O₂, 表明Cu(I)在室温下较稳定; 而Cu(I)在对CO与C₂H₄的吸附中, 除了CO的吸附热与Cu(0)的相近外, 所生成的吸附热与吸附量均较高。红外光谱也表明, Cu(I)比Cu(0)更容易吸附CO与C₂H₄。C₂H₄仅仅以π-键键合在Cu(0)表面, 而在Cu(I)表面上却是以di-σ和π-键键合, 由于di-σ键较强, 使得C₂H₄在Cu(I)上具有较高的吸附热。

英文摘要:

The Cu-MCM-41 mesoporous materials with different contents of Cu were synthesized. It was found that a reduction in the high temperature did not alter the mesoporous structure of the materials. The copper in walls of MCM-41 silica was easily reduced to Cu(0) in H₂, and a heat treatment in flowing He resulted in the reduction of Cu(II) to Cu(I). The Cu(0) strongly adsorbed O₂ and the adsorption heat was up to 427 kJ·mol⁻¹, while Cu(I) did not adsorb O₂ at room temperature, indicating better stability of Cu(I) at ambient temperature. However, in the cases of the adsorption of CO and ethylene on Cu(I), apart from the adsorption heat for CO being nearly the same as that of Cu(0), the adsorption heat and the adsorption quantity on Cu(I) were all higher. And the results of infrared spectra also showed that the cases of the adsorption of CO and ethylene on Cu(I) were easier than that on Cu(0). Adsorbed ethylene on Cu(0) was only via π-bond while that on Cu(I) was via both di-σ and π-bonds. Due to the di-σ bond strength being larger than the strength of π-bond, the adsorption heat of ethylene on Cu(I) is higher.

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