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研究论文

在泡沫碳化硅载体上原位生长silicalite--1型沸石晶体

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摘要:

以多晶硅颗粒为硅源, 在泡沫碳化硅载体上原位水热合成silicalite--1型沸石晶体。研究了硅颗粒加入量、NaOH浓度以及合成时间等因素对沸石晶体的负载量、晶体尺寸和沸石晶体/泡沫碳化硅复合材料比表面积的影响。结果表明,
以多晶硅颗粒为硅源控制硅酸根的释放速度, 使沸石晶体在碳化硅载体表面异质界面形核, 从而实现沸石晶体在泡沫碳化硅载体表面的连续生长; 当多晶硅量过少时, 溶液中的硅酸根浓度过低, 不能在载体表面形成连续生长的沸石层;
而当多晶硅量过大时, 溶液中硅的浓度过高, 部分沸石晶体在溶液当中形核, 使沸石晶体在载体表面的负载量下降; 提高溶液中NaOH的浓度, 加快硅的溶解, 使溶液中硅的饱和浓度升高, 沸石晶体的形核率也随之升高, 使沸石晶体的负载量增加。在最优条件下制备的silicalite--1/泡沫碳化硅复合材料其沸石晶体的比表面积为81.28 m^2g^{-1}。

关键词: 无机非金属材料 silicalite-1/泡沫碳化硅复合材料 固态硅源 silicalite-1 型沸石 水热合成

Growth of Silicalite–1 Coatings on SiC Foam Support

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Abstract:

Solid polycrystalline silicon particles were used as Si source for in situ hydrothermal synthesis of continuous silicalite–1 coating on SiC foam support in this paper. It is supposed that the Si dissolution rate was suppressed by using solid Si source, which subsequently led to zeolite crystals preferential nucleation and growth on the support. The loading amount, crystal size, layer thickness and specific surface area of the synthesized zeolite coatings were investigated with respect to the polycrystalline silicon particle amount and concentration of NaOH and reaction time. It is found that continuous zeolite layer can not form on the SiC foam ceramic support with too low amount of polycrystal silicon, because of the low concentration of silicic acid radical ions in the solution. By contrast, when the polycrystal silicon amount is too high, the zeolite loading on the support is low. In addition, increasing the NaOH concentration can promote silicon dissolution, increase the saturation concentration of silicon, promote the zeolite nucleation, and increase the loading of zeolite crystals. Zeolite layer with the maximum loading amount of zeolite and a specific surface area of 81 m2g−1 was fabricated on the SiC foam support under optimum conditions.

Keywords: Inorganic non-metallic materials Zeolite/SiC foam composite Solid Si source silicalite-1 type zeolite Hydrothermal synthesis

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