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研究论文

Cr或V掺杂的HMS在甲酸溶液中的光催化产氢性能研究

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摘要 本文以过渡金属离子M(M代表Cr或V)掺杂为改性手段，通过改变掺杂量，合成了一系列分子筛光催化剂M(x)-HMS(x代表M/Si摩尔投料比)。用X-射线荧光光谱(XRF)、低温 N2 吸附-脱附、X-射线衍射(XRD)和紫外-可见吸收漫反射光谱(UV-vis)对M(x)-HMS进行了表征和分析。以高压汞灯为光源，以甲酸分解产氢为探针反应，研究了M(x)-HMS的光催化性能，发现Cr(x)-HMS和V(x)-HMS的产氢速率随组成变化呈双峰规律(均在x＝0.01和0.05时出现两个极大值)，并从光催化剂的组成和结构角度给予了解释。以过渡金属离子M (M代表Cr或V)掺杂为改性手段，通过改变掺杂量, 合成了一系列分子筛光催化剂M(*x*)-HMS (*x*代表M/Si投料摩尔比). 用X射线荧光光谱(XRF)、低温N_2吸附-脱附、X射线衍射(XRD)、紫外-可见吸收漫反射光谱(UV-vis)、高分辨透射电子显微镜(HRTEM)和X射线能量散射谱(EDXS)对M(*x*)-HMS进行了表征和分析. 以高压汞灯为光源, 以甲酸分解产氢为探针反应, 研究了M(*x*)-HMS的光催化性能, 发现Cr(*x*)-HMS和V(*x*)-HMS的产氢速率随组成变化呈双峰规律(均在*x*＝0.01和0.05时出现两个极大值), 并从光催化剂的组成和结构角度给予了解释.

关键词 介孔分子筛 HMS 光催化 甲酸 产氢

分类号

Photocatalytic Performance of HMS Doped with Chromium or Vana-dium for Hydrogen Production in Aqueous Formic Acid Solution

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Abstract A series of transition metal doped photocatalysts, denoted as M(*x*)-HMS (here, M represents Cr or V, *x* represents the molar ratio of M/Si in the feed reagents and HMS represents hexagonal mesoporous silica molecular sieves), were synthesized by adjusting the value of *x*. The HMS materials were characterized and analyzed by X-ray fluorescence spectroscopy (XRF), N_2 adsorption-desorption isotherms, X-ray diffraction patterns (XRD), ultraviolet-visible diffuse reflectance spectra (UV-vis), high-resolution transmission electron microscopy (HRTEM) and energy dispersive X-ray spectroscopy (EDXS). The photocatalytic activity was investigated using high pressure mercury lamp as the light source and the decomposition of formic acid to produce hydrogen as probe-reaction. Interestingly, the rate of hydrogen production for both Cr(*x*)-HMS and V(*x*)-HMS shows bimodal character which coincidentally corresponds to the *x* value of 0.01 and 0.05, and it was interpreted in terms of the components and structures of M(*x*)-HMS.

Key words mesoporous molecular sieve HMS photocatalysis formic acid hydrogen production

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