

铁镍磷化物催化剂在 CO 加氢制低碳醇反应的应用

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摘要 通过程序升温还原法制备了一系列氧化硅负载的不同 P/M (M = Fe 和 Ni) 摩尔比的金属磷化物催化剂, 在 553 K, 5.0 MPa 和 H₂:CO = 2 (摩尔比) 的反应条件下用固定床反应器测试了它们催化 CO 加氢反应性能。结果表明, 在 FeP_x/SiO₂ (x 为 P/M 摩尔比) 催化剂上, 液相产物是以甲醇为主的低碳含氧化物的混合物。而在 NiP_x/SiO₂ 催化剂上, 气态产物主要为甲烷, 液相产物绝大多数是甲醇。表征结果表明, 磷化物催化剂上的 Fe₂P, Fe₃P, Ni, Ni₂P, Ni₃P 和 Ni₁₂P₅ 晶相在反应条件下是稳定的, 没有形成磷化物的金属铁, 在反应后转变成碳化铁晶相。

关键词: 一氧化碳 加氢 含氧化物 金属磷化物 磷化铁 磷化镍 氧化硅

Abstract: A series of silica supported iron and nickel metal phosphides with different molar ratios of P to metal were synthesized by the temperature programmed reduction method. Their catalytic performance for CO hydrogenation in a fixed bed reactor was tested with the conditions of 553 K, 5.0 MPa, and H₂:CO = 2 (molar ratio). With the FeP_x/SiO₂ catalysts (x denotes the molar ratio of P to metal), the product was a mixture of oxygenates containing methanol as the major component. With the NiP_x/SiO₂ samples, the liquid product was mainly methanol. The Fe₂P, Fe₃P, Ni, Ni₂P, Ni₃P, and Ni₁₂P₅ phases were stable during CO hydrogenation, while most of the metallic Fe phase transformed into iron carbide.

Keywords: carbon monoxide hydrogenation, oxygenates, metal phosphides, silica, iron phosphide, nickel phosphide

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