

NiW/ γ -Al₂O₃催化剂的低温煤焦油加氢性能研究

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Hydroprocessing of low temperature coal tar on NiW/ γ -Al₂O₃ catalyst

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摘要 以 γ -Al₂O₃为载体,采用等体积浸渍法制备了不同Ni/W原子比的低温煤焦油加氢处理催化剂,并以BET、XRD、H₂-TPR和TG对催化剂进行表征。在固定床反应器中,以低温煤焦油小于350℃馏分作为原料对催化剂进行了加氢性能的评价,并采用蒸馏、GC/MS、荧光指示剂吸附及元素分析对原料及产物的馏分分布及组成进行了分析。结果表明,NiO和WO₃在载体上形成了均匀分散,NiO含量较低时与 γ -Al₂O₃有较强的作用力而难以还原。当Ni/W原子比为0.38时,酚类化合物的转化率、航煤馏分选择性以及产物中环烷烃和氢化芳烃的含量均最高,加氢脱硫(HDS)活性、加氢脱氮(HDN)活性及产物的H/C原子比也最高,说明Ni/W原子比为0.38时,NiW/ γ -Al₂O₃催化剂对煤焦油加氢处理具有较好的效果。

关键词: 低温煤焦油 加氢处理 催化剂

Abstract: γ -Al₂O₃ supported catalysts with different Ni/W atomic ratios for the hydroprocessing of low temperature coal tar (LTCT) were prepared and characterized by BET, XRD, H₂-TPR and TG analysis. The hydroprocessing of <350℃ fraction of LTCT was carried out in a fixed-bed reactor. The product distribution and composition were analyzed by distillation, GC/MS, fluorescent indicator adsorption and elementary analysis. The results show that NiO and WO₃ are evenly distributed on the support surface; and low-loading NiO is difficult to reduce since the strong force is formed with the support surface. The phenol conversion, the selectivity of kerosene fraction and the content of naphthene and hydro-aromatic in the product are the highest at a Ni/W atomic ratio of 0.38, while the activities of HDS and HDN and the H/C atomic ratio in the product are also the best. It indicates that the NiW/ γ -Al₂O₃ catalyst with an optimum Ni/W atomic ratio of 0.38 is appropriate for the hydroprocessing of LTCT.

Key words: low temperature coal tar hydroprocessing catalyst

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