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催化、动力学与反应器

Pt-Sn-Li/Al_2O_3/FeCrAl催化剂的制备、表征和长链烷烃脱氢催化性能

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摘要

以FeCrAl合金薄片为基体，Pt-Sn-Li/γ-Al_2O_3为活性涂层，制备了Pt-Sn-Li/Al_2O_3/FeCrAl金属基复合载体负载型催化剂。采用XRD、SEM、TPR等手段对催化剂进行了表征，并在微型固定床反应器中考察了不同反应温度、液时空速和氢/烃摩尔比下对长链烷烃脱氢的催化性能。结果表明，将活性浆料直接涂覆于焙烧后的金属薄片上制得的催化剂有良好的结合性能，经超声波振荡后涂层脱落率小于2%。当Pt-Sn-Li/γ-Al_2O_3活性涂层涂覆到FeCrAl金属基体后复合载体Al_2O_3/FeCrAl与活性成分的相互作用明显增强。催化反应性能评价表明，较高的反应温度有利于长链烷烃脱氢过程，但温度过高时将加速催化剂积炭失活。较低的空速有利于十二烷的转化，但进一步减小空速将造成十二烯的选择性明显降低。减小氢/烃摩尔比虽然有利于提高十二烷的转化率，但进一步减小氢/烃摩尔比也将加速催化剂积炭失活。

关键词

Pt-Sn-Li/Al_2O_3/FeCrAl催化剂 金属基载体 长链烷烃（十二烷） 脱氢 表征

分类号

Preparation and characterization of Pt-Sn-Li/Al_2O_3/FeCrAl catalyst and its catalytic performance for long chain alkane dehydrogenati

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Abstract

Pt-Sn-Li/Al_2O_3/FeCrAl catalyst was prepared by using FeCrAl alloy foil as the base of support and Pt-Sn-Li/γ-Al_2O_3 as the active coating.The catalyst was characterized by means of XRD，SEM，H_2-TPR.The effects of temperature，LHSV and the molar ratio of hydrogen to alkane on the catalytic performance for the long chain alkane dehydrogenation were investigated in a fixed-bed microreactor.The results indicated that the adhesiveness between support and active coating was very good，and only less than 2% coating was peeled off after ultrasonic vibration treatment.The interaction between Al_2O_3/FeCrAl metallic composite support and active components was strengthened distinctly，after the active coating was supported on FeCrAl alloy foil.A higher temperature benefited the dehydrogenation reaction，but an overly high temperature would accelerate the coking deactivation of catalyst.A lower LHSV benefited the conversion of the alkanes，but a further decrease of LHSV would reduce the selectivity of the alkenes.A lower molar ratio of hydrogen to alkane benefited the conversion of the alkanes，but similarly，a too low molar ratio of hydrogen to alkane would accelerate the catalyst deactivation by carbon deposition.

Key words

Pt-Sn-Li/Al_2O_3/FeCrAl catalyst metallic-based support long chain alkane（dodecane）

dehydrogenation characterization

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