

Study on Pd Catalyst Supported on Carbon Materials for C₂ Hydrogenation

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Abstract : At present, the preparation of the catalyst by carbon carrier is one of the improvement directions of the C₂ pre-hydrogenation catalyst. Carbon materials can be prepared from coal direct liquefaction residues, coconut shells, biomass, etc., and the pore structure of carbon carrier materials can be adjusted through the preparation process; at high temperatures, the carbon carrier itself also shows certain catalytic activity. Therefore, this paper mainly selected typical activated carbon and coconut shell carbon as carbon carrier materials, studied their microstructure and surface properties, prepared a series of carbon-based catalysts loaded with Pd, and investigated the effects of the content of promoter Ag and the concentration of reductant on the structure and performance of the catalyst and its catalytic performance for the pre hydrogenation of C₂. In this paper, the carbon supports from two sources and the catalysts prepared by them were characterized in detail. The results showed that the morphology and structure of different supports and the performance of the catalysts prepared were also obviously different. The catalyst supported on coconut shell carbon has a small specific surface area and large pore diameter. The catalyst supported on activated carbon has a large specific surface area and rich pore structure. The active carbon support is mainly a mixture of amorphous graphite and microcrystalline graphite. For the catalyst prepared with coconut shell carbon as the carrier, the sample is very uneven, and its specific surface area and pore volume are irregular. Compared with coconut shell carbon, activated carbon is more suitable as the carrier of the C₂ hydrogenation catalyst. The conversion of acetylene, methyl acetylene, and butadiene decreased, and the ethylene selectivity increased after Ag was added to the supported Pd catalyst. When the amount of promoter Ag is 0.01-0.015%, the catalyst has relatively good catalytic performance. Ag and Pd form an alloying effect, thus reducing the effective demand for Ag. The Pd Ag ratio is the key factor affecting the catalytic performance. When the addition amount of Ag is 0.01-0.015%, the dispersion of Pd on the carbon support surface can be significantly improved, and the size of active particles can be reduced. The Pd Ag ratio is the main factor in improving the selectivity of the catalyst. When the additional amount of sodium formate is 1%, the catalyst prepared has both high acetylene conversion and high ethylene selectivity.

Keywords : C₂ hydrogenation, activated carbon, Ag promoter, Pd catalysts

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