
Preparation of Catalyst with Microwave Induced Plasma Jet Combined with Spouted Bed

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Plasma technologies have been widely used for various catalyst preparation in recent years. In this work, a combination of microwave induced plasma and spouted bed was proposed for catalyst preparation. The plasma spouted bed reactor provides homogeneous particle treatment, and the particles in the reactor experience a repetition of low-temperature and high-temperature depending on the region due to strong agitation and high temperature in the vicinity of the plasma. As a model catalyst, Pd/Al₂O₃ was prepared here. For comparison, the conventional heating process with an electric furnace was used to prepare Pd/Al₂O₃. Despite the short treatment time, Pd/Al₂O₃ was successfully produced using the plasma spouted bed. The selective hydrogenation of acetylene to ethylene was chosen to evaluate their catalytic activity. The results indicated that the catalyst prepared by the plasma spouted bed showed higher conversion and ethylene selectivity than those prepared by the conventional heating. Catalyst characterizations were carried out by X-ray diffraction (XRD), Scanning electron microscope (SEM), BET and H₂ chemisorption to elucidate effects of the plasma spouted bed. From the analytical results, the catalyst prepared by the plasma spouted bed showed higher dispersion of Pd metal on the alumina support than those by general method. It is suggested that the plasma spouted bed has a great potential as a novel technique for catalyst preparation.