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Design and construction of mercury-free catalysts and study on their catalytic reaction of acetylene hydrochlorination

Abstract:

Combined with China's energy structure of "rich coal, poor oil and little gas" and the demand of chlor-alkali chemical industry, and in view of the serious mercury pollution in vinyl chloride monomer (VCM) synthesis process by calcium carbide acetylene method, the high cost of mercury-free catalyst and the lack of effective scientific and technological support for China's implementation of the Minamata Convention, we studied the scientific problems of how to modulate ligand configuration, metal precursor, carrier texture and surface properties as well as coordination, load and thermal activation conditions to build a synergistic catalytic active center based on heteroatom limited domain, and how to study the effects of reactants and products on the evolution of the structure and electronic properties of the active center to reveal the reaction/deactivation mechanism, and further to guide the construction of active center and support preparation, thus improving the stability of the catalyst. The effective control method of surface microenvironment and pore structure of carbon material was also established, which provided the support basis for the high efficiency mercury-free catalyst. Meanwhile, the construction method of collaborative catalytic active center was established. The catalytic mechanism and deactivation mechanism were elucidated, the regeneration method was explored, and the optimization method of preparation and reaction process of mercury-free catalyst was obtained. These can provide technical guarantee for solving the mercury pollution of the VCM synthesis process and fulfilling the International Minamata Convention.

Biography

Haiyang Zhang has completed his PhD at the age of 28 years from Tianjin University and visiting scholar project research from Cardiff University. He is a professor of Shihezi University, a comprehensive research university in China. He is mainly engaged in the research and development of mercury-free catalysts for acetylene hydrochloride, design and synthesis of high-performance metal catalysts and other industrial catalysis research, and he has published more than 50 papers in reputed journals.