Ammonia Adsorption Properties of Composite Ammonia Carriers Obtained by Supporting Metal Chloride on Porous Materials

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Abstract : Ammonia is an important carrier of hydrogen energy, with the characteristics of high hydrogen content density and no carbon dioxide emission. Ammonia synthesis by the Haber process is the main method for industrial ammonia synthesis, but the conversion rate of ammonia per pass is only about 12%, while the conversion rate of biomass synthesis ammonia is as high as 56%. Therefore, safe and efficient ammonia capture for ammonia synthesis from biomass is an important way to alleviate the energy crisis and solve the energy problem. Metal chloride has a chemical adsorption effect on ammonia, and can be desorbed at high temperature to obtain high-concentration ammonia after combining with ammonia, which has a good development prospect in ammonia capture and separation technology. In this paper, the ammonia adsorption properties of CuCl₂ were measured, and the composite adsorbents were prepared by using silicon and multi-walled carbon nanotubes respectively to support CuCl₂, and the ammonia adsorption properties of the composite adsorbents were studied. The study found that the ammonia adsorption capacity of the three adsorbents decreased with the increase in temperature, so metal chlorides were more suitable for the low-temperature adsorption of ammonia. Silicon and multi-walled carbon nanotubes have an enhanced effect on the ammonia adsorption of CuCl₂. The reason is that the porous material itself has a physical adsorption effect on ammonia, and silicon can play the role of skeleton support in cupric chloride particles, which enhances the pore structure of the adsorbent, thereby alleviating sintering.

Keywords : ammonia, adsorption properties, metal chloride, silicon, MWCNTs

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