Structural Properties and Benzene Adsorption Performance of Acid Activated Palygorskite

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Abstract: In this study, structural properties and benzene adsorption performance of Palygorskite activated by different concentrations of hydrochloride acid were discussed. The acidification resulted in larger specific surface area and pore volume, while most probable pore size remained unchanged. The acid dissolution of octahedral cations occurred at the terminal face and the external surface of palygorskite. With the removal of octahedral cations (Mg^{2+}, Fe^{3+} and Al^{3+}), the amorphous SiO_2 formed from the tetrahedral sheet retained rod-like morphology of natural palygorskite. Benzene adsorption capacities of acid Palygorskite achieved 1.35 and 1.20 times higher than the raw one in low pressure region and high pressure region, respectively. Surface areas and micropore volumes were predominantly responsible to the adsorption in low pressure region, while the affinity between porous surface and benzene molecules dominated in the medium pressures. As for the high pressure region, mesopores and macropores adsorption became the main factor influencing adsorption performance.

Keywords: Palygorskite; Acid activation; Adsorption; Benzene