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Role of inherent active constituents on mercury adsorption capacity of chars from four solid wastes

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Abstract

Many raw materials have active constituents for mercury removal, such as the elements oxygen (O), sulfur (S) and chloride (Cl), but these constituents are frequently neglected during the preparation process of mercury adsorbents. This study investigated the effect of various inherent active constituents of four solid wastes (waste tire, cotton straw, Chinese medicinal residue and municipal solid waste) on the mercury removal performance of their derived chars. Modification methods (chemical impregnation and physical activation) were used to clarify modification influence on inherent active constituents and mercury removal performance of chars. Brunauer–Emmett–Teller (BET) analysis, Fourier transform infrared spectroscopy (FTIR), X-ray photoelectron spectroscopy (XPS), temperature programmed decomposition technic (TPDT) and elemental mercury adsorption testing were used to measure and evaluate various chars. The results indicated that only waste tire generated mercury chemisorption sites (sulfide) during pyrolysis process. Sulfide could oxidize Hg^0 into HgS on char T6 derived from tire waste whereas sulfate could not on char derived from Chinese medicinal residue. The evaporation of element Cl during pyrolysis process led to the low adsorption capacity of municipal waste

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