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Room Temperature Sulfur Removal from LPG with Adsorbent for Fuel Cell Application — Adsorption Behavior of Sulfur Compounds

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LPG contains 5-10 volppm of sulfur compounds such as thiols, sulfides, and disulfides. Use of LPG as the hydrogen source for fuel cells will require the removal of sulfur content to the ppb level. Active carbon, CuO/ZnO/Al₂O₃, Ag-exchanged β zeolite and Ag/CeO₂ were examined as sulfur adsorbents at room temperature using propane containing 2-methyl-2-propane thiol (TBM: *t*-butyl mercaptane), dimethylsulfide (DMS), dimethyldisulfide (DMDS), and carbonyl sulfide (COS). Sulfur compounds were not removed effectively by active carbon. CuO/ZnO/Al₂O₃ showed excellent removal of TBM, but removal of DMS ceased after a short time. Ag-exchanged β zeolite achieved excellent removal of TBM, DMS and DMDS, but COS was not removed. Ag/CeO₂ removed all types of sulfur compounds and provided superior removal of COS compared to the other sulfur adsorbents. Ag/CeO₂ and CuO/ZnO/Al₂O₃ tended to adsorb reactive sulfur compounds more strongly. Ag-exchanged β zeolite adsorbed sulfur compounds associatively, and the larger the negative charge of the sulfur atom of the compound, the stronger the coordination bonding between the Ag cation and the sulfur atom of the compounds. In contrast, Ag/CeO₂ adsorbed sulfur compounds dissociatively, and produced sulfur atoms at room temperature.

Keywords: [Adsorptive sulfur removal](#), [β zeolite](#), [Ceria](#), [Fuel cell](#), [LPG](#)

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