The use of thermal treatment residues for H2S removal from biogas

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Abstract

Hydrogen sulfide (H2S) removal from biogas is a fundamental step before its exploitation for protection of downstream facilitiesies while reducing toxic emissions in the atmosphere. The use of alternative materials for biogas treatment, in addition of the positive impact on the environment, can reduce the costs of biogas as an energy vector and enable its development.

This work aims to assess H2S adsorption efficiencies with four different types of thermal treatment residues: a biochar, a biomass ash, a municipal solid waste incineration (MSWI) bottom ash and an incinerated sewage sludge. All H2S adsorption experiments were realized with a real landfill biogas. Tested materials were characterized before and after adsorption in order to evaluate their physicochemical properties related to their adsorption capacities.

The results highlighted that biochar, biomass ash and MSWI bottom ash are efficient adsorbents as they can retain more than 120 mg of H2S per gram of dry matter, despite these materials have very different features. Biomass ash and MSWI bottom ash are basic, humid and mineral materials, whereas biochar is dry, mainly organic and very porous. On the contrary, incinerated sewage sludge could adsorb only a small amount of H2S under tested experimental conditions, underlining the importance of the porosity of materials for sufficient H2S adsorption.

Keywords: *Biogas treatment, Hydrogen sulfide adsorption, alternative materials, waste management*