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Use of sulfide/phosphate based sorbents for mercury removal from natural gas: A focus on the Hg stabilization

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Mercury is a toxic and bioaccumulative global pollutant. The standards of its control are increasingly restrictive motivating the development of new removal technologies. Adsorption process is an important process to mercury capture from gaseous streams with low Hg^0 concentrations, for example natural gas. Beyond of the hazards related to the mercury exposure, Hg^0 is also associated with serious failures on natural gas plants by corrosion of equipments and structures. In the present study, hydroxyapatite-based sorbents modified with copper sulfide were tested as sorbents with both high mercury affinity and stabilization capacity. These characteristics were investigated in dynamic and static Hg^0 adsorption tests, leachability and thermal stability tests. In the mathematical modeling approach, a chemical Hg fixation term was added to classic fixed-bed adsorption models. The chemical reaction mechanism for mercury fixation into the solid matrix was supported by X-ray diffraction results. The experimental results have proven the mercury stabilization capacity of tested sorbents even under severe conditions of temperature and pH. The proposed mathematical model, with its optimized parameters, was used to study the dynamic behavior of a fixed bed adsorption process at different simulated operational conditions. Simulation results show that the chemical fixation of mercury inside the solid matrix leads to an increase of mercury removal capacity and reduces the risk of mercury re-emission after used sorbent disposal.

Biography

Carla Luciane Manske Camargo undergraduated in Chemical Engineering in 2010 at Federal University of Rio Grande (FURG). In 2013, she concluded her MSc degree studies at Alberto Luiz Coimbra Institute for Graduate Studies and Research in Engineering (COPPE), Federal University of Rio de Janeiro (UFRJ). Currently, she remains in the last institution as a PhD student. Her research includes a mathematical modelling approach for mercury removal from gaseous streams focused on natural gas using sulfide/phosphate based sorbents.

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