

Master project: Removal of sulfide contaminants from hot biogas

Biogas produced by the anaerobic digestion of biomass and organic wastes typically contains high levels of gaseous sulfides (up to 1%). These contaminants are harmful for combined heat-power (CHP) systems and it is therefore necessary to decrease their concentrations in the biogas before injecting it to the application (ppm-level). Typically, biogas is first treated by ambient temperature physical or chemical absorption methods to remove the largest part of the contaminants. Such processes are relatively cheap but leave residual sulfides in the gas. For feeding biogas to an SOFC, it is recommended to decrease the total gaseous sulfide content down to 1 ppm. To achieve that, polishing sorbents are normally used but their efficiency varies with the biogas composition. Particularly, their adsorption capacity is limited and saturated sorbents have to be treated as special wastes.

This Master project will aim at developing a new method for performing a deep cleaning of biogas by using the heat produced by the CHP system to trigger the sulfur capture (sulfidation) by a hot metallic bed. Based on bibliographic data, she/he will select metal candidates that will be tested experimentally. Experimental setup will be designed and set so that sulfidation kinetics, thermodynamics, and reversibility could be measured. These investigations will take place within the Group of Energy Materials (SCI-STI-JVH GEM) at EPFL-Valais (Sion) under the supervision of Jan Van herle and Cedric Frantz.

We are looking for a highly motivated student that could conduct independent research and start this topic in our laboratory. She/he should be able to conduct a precise and targeted literature review and make well-informed decisions. A background in materials chemistry is required. Understanding of thermodynamics, kinetics, and catalysis is an important asset. Finally, knowledge and hands-on experience of materials characterization would be a plus.

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