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Bench-scale testing of ZnO based sorbents for hot gas cleanup

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Abstract

Gasification of a high sulphur coal, in particular for hydrogen production, requires the use of highly efficient desulphurisation systems in order to meet the emission regulations and to preserve the equipment from corrosion. High temperature desulphurisation of syngas from coal gasification is considered as one of the most promising advanced technologies to remove sulphur components. In addition the method offers potential improvements on the thermal efficiency of systems using coal gasification, such as IGCC (Integrated Gasification Combined Cycle), SOFC (Solid Oxides Fuel Cell), MCFC (Molten Carbonate Fuel Cell) technologies.

Regenerable metal oxides sorbents are the best candidates for hydrogen sulphide removal from hot coal syngas.

Sotacarbo, together with other partners, is currently engaged in the CARBOMICROGEN research project (partially funded from the Italian Ministry of Education, University and Research), regarding development and optimization of coal-to-hydrogen technologies for distributed power generation. In this field, a series of experimental tests has been carried out in order to characterize different commercial ZnO based sorbents to be used in the hot gas desulphurisation system included in the Sotacarbo coal-to-hydrogen pilot plant.

This paper shows the main results of the preliminary experimental tests set up in the MOSCA (Metal Oxides for Sulphur Compounds Adsorption) bench scale plant in the Sotacarbo Laboratories. The sulphidation of commercially produced ZnO based sorbents has been investigated over a range of operating conditions relevant to the Sotacarbo pilot plant. A non-reducing bi-component mixture of H_2S and N_2 (with a H_2S concentration of 1.5% in volume) has been selected in order to reproduce the typical H_2S concentration in a coal syngas obtained through the gasification of Sulcis coal in an air-blown fixed-bed gasifier.

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