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High-Temperature Desulfurization of a Producer Gas by La- and Ce-based Oxides

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The deep high-temperature desulfurization of a producer gas is a necessary step to efficient power production by solid oxide fuel cells. The sorbents currently used for such desulfurization are mostly based on ZnO and CuO, which deteriorate above 773 K.¹ Based on thermodynamic calculations,² we decided to test the possibility of using sorbents containing La and Ce oxides. The prepared sorbents contained either La₂O₃ or nonstoichiometric cerium oxide CeO_x (x=1.5–2) on an alumina support. The sulphur capacity and desulfurization efficiency of both sorbents were tested at 773 K in various gas mixtures containing reducing gases (e.g. H₂, CO) and H₂S as the model sulfur compound. These preliminary laboratory tests implied that each sorbent was capable of high desulfurization efficiency. Next, experiments performed in artificial producer gases (CO, H₂, CO₂, H₂O, N₂ and H₂S) of varying compositions showed the negative influence of increasing amounts of CO₂ and H₂O, as well as the importance of pre-reduction in the case of the cerium-based sorbent. Thus, the application of La- and Ce-based sorbents for deep high-temperature desulfurization seems to be feasible for producer gases with low concentrations of CO₂ and H₂O.

References

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