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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.<sup>1</sup> Based on thermodynamic calculations,<sup>2</sup> we decided to test the possibility of using sorbents containing La and Ce oxides. The prepared sorbents contained either La<sub>2</sub>O<sub>3</sub> or nonstoichiometric cerium oxide CeO<sub>x</sub> (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. H<sub>2</sub>, CO) and H<sub>2</sub>S 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, H<sub>2</sub>, CO<sub>2</sub>, H<sub>2</sub>O, N<sub>2</sub> and H<sub>2</sub>S) of varying compositions showed the negative influence of increasing amounts of CO<sub>2</sub> and H<sub>2</sub>O, 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 CO<sub>2</sub> and H<sub>2</sub>O.

## *References*

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2. Svoboda, K.; Leitner, J.; Havlica, J.; Hartman, M.; Pohořelý, M.; Brynda, J.; Šyc, M.; Chyou, Y.-P.; Chen, P.-C. Thermodynamic aspects of gasification derived syngas desulfurization, removal of hydrogen halides and regeneration of spent sorbents based on La<sub>2</sub>O<sub>3</sub>/La<sub>2</sub>O<sub>2</sub>CO<sub>3</sub> and cerium oxides. *Fuel* **2017**, *197*, 277–289.