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## Thermodynamic analysis of nano particle ceria-based oxides at elevated pressure for solar thermochemical redox cycles fuel production

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The thermodynamics of nano-ceria-based metal oxides have been studied in the context of solar thermochemical redox cycles for splitting $H_2O$ and $CO_2$ at elevated pressure. Because of the resistance to high temperature of nano-ceria-based metal oxides $MxCe1-xO_2$, such systems are suitable for resolving stability problems frequently encountered with high-temperature operations. Catalytic systems for $CO_2/H_2O$ conversion, with Gd, Y, Sm, Ca, Sr, nano-particle ceria-based perovskite, were synthesized, and tested at close to industrial conditions at the Royal Institute of Technology in Stockholm. Oxygen nonstoichiometric was investigated at high temperatures, pressure for a redox system. Subsequently, relevant thermodynamic parameters were computed and equilibrium $H_2$ and CO concentrations determined as a function of reduction conditions (T, $PO_2$) and ensuing oxidation temperature. At 8 bar and above 1073 K, the degree of reduction is positive for pure nano-ceria particle. As a result, at a given reduction temperature and elevated pressure, more $H_2$ and CO is generated at equilibrium state.

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