# HYDROGEN PRODUCTION FROM WATER-SPLITTING THERMOCHEMICAL CYCLES WITH CONCENTRATED SOLAR ENERGY


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Hydrogen is considered as the best candidate to replace oil and gas in the transportation sector. Its massive production must be achieved with environmentally friendly processes to solve problems of greenhouse gas emissions during fossil fuels combustion. Thermochemical cycles use chemical intermediates to split water in several chemical reactions. A screening of cycles showed the interest of metal oxide redox pairs that suit well solar concentrated energy characteristics (high temperature).

A thermodynamic analysis and an experimental study demonstrated the hydrogen production potential of iron oxides, mixed oxides based on ceria and zinc oxide cycles. Reactions temperatures and kinetics of reductions were determined accurately by thermogravimetric analysis. Hydrogen generation reactions were tested with solar reduced oxides to measure hydrogen produced and then maximum reaction conversion and hydrogen yields.

Experimental results were used to carry out a process study of the promising cycles. Mass and energy balances were established to evaluate process efficiencies and hydrogen quantities produced with a solar tower like PS10. Finally, the hydrogen production cost with such a solar plant was estimated.