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Doped ferrites and their role on the production of hydrogen through thermochemical redox cycles

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The thermochemical storage of solar energy is a method to store high energy densities in the form of chemical bonds, requiring only small amounts of material to store large amounts of energy.^{1,2} Metal oxides are promising materials to produce hydrogen from thermochemical cycles, being an environmentally friendly and sustainable option.^{1,2}

Iron oxide has been widely used as an oxygen carrier material for hydrogen production due to its favorable thermodynamic properties. However, iron oxide loses much of its activity after redox cycling due to sintering and agglomeration.

Spinel ferrites were claimed to be very attractive redox materials, with several advantages such as high solar-to-fuel efficiency, rapid CO₂ splitting kinetics and high thermodynamic driving force. Spinel ferrites can be reduced at a relatively low temperature. The reduced products of the spinel ferrites have a higher melting point, which gives great potential for sintering resistance.³

Magnesium and cobalt based ferrites are reported herein as promising redox materials for thermochemical two-step H₂O and CO₂ splitting to produce H₂ and CO. Their synthesis was carried out and tested to verify their suitability for use in thermochemical cycles. The prepared cobalt ferrite was analyzed by scanning electron microscope and X-ray diffractometry (**Figure 1**) that confirmed the formation of the desired compound and is being subjected to thermogravimetric and cycling studies to verify its efficiency in the redox reactions.

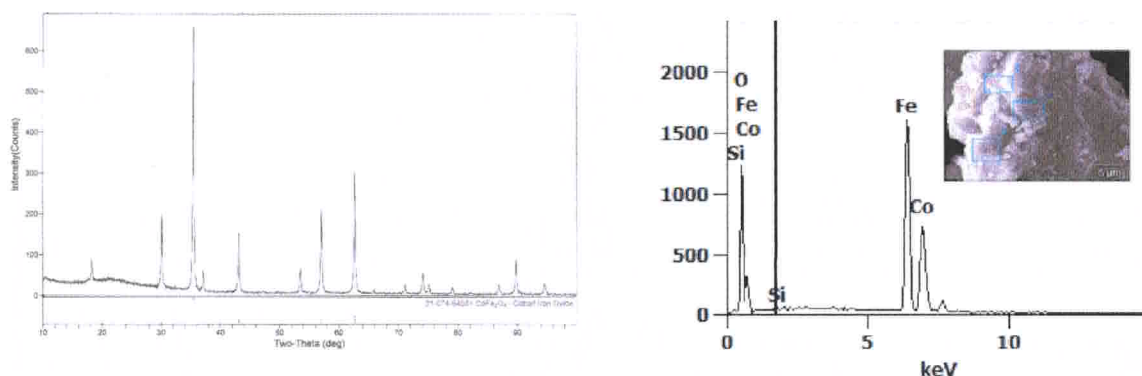


Figure 1 – X-ray Powder Diffraction and Energy Dispersive X-ray Microanalysis of the cobalt ferrite synthesized

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