Elaboration of metal scrap-based hydroreactive materials and their application for hydrogen production

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A process for hydrogen production from the oxidation of powder materials manufactured from magnesium-aluminum scrap (ML5 alloy, aircraft construction waste produced by metal processing) and low-melting-point alloys (Wood's and Rose alloys) in aqueous media was studied. The scrap-based powder materials were fabricated by high-energy ball-milling, resulting in the formation of so-called "micro-galvanic cells' between Mg and Al and the components of low-melting-point alloys (Bi, Sn, Pb) and intermetallic compound (Mg2Sn) created during ball-milling as well. The effect of galvanic corrosion of magnesium and aluminum in conductive media (NaCl aqueous solution) substantially intensified hydrogen evolution, leading to high reaction rates and total hydrogen yields. The resulting hydrogen can be effectively utilized by its supplying to fuel cells, infrared heaters, gas turbines or internal combustion engines for electricity and heat generation or co-generation.