MATERIAIS 2007
Porto, 1-4 April 2007

MATERIALS FOR SOLAR HYDROGEN PRODUCTION WITH SIMULTANEOUS MINERALIZATION OF ETHANOL

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Keywords: hydrogen, doped-titanium dioxide, ethanol, semiconductor electrodes

Abstract

The photo-catalytic production of hydrogen by means of irradiation of a suspension of semiconductor oxides presents attractive features over other methods with higher cost such as water electrolysis.

In this work, photocatalytic hydrogen production from water is studied, using ethanol as sacrificial agent.
New nanostructured multifunctionalised semiconductor materials based on titanium dioxide, with effective photo-catalytic properties under UV illumination were synthesized using sol-gel technology and characterised by X-Ray diffraction and scanning electron microscopy. Aqueous suspensions of the semiconductor powders were used and the effect of solution pH and temperature (20-70ºC) as well as the effect of concentration of ethanol on hydrogen production were studied, for fixed concentrations of the catalyst. Comparison is made with doped Degussa-P25 TiO_2 titanium dioxide.

The need to decrease the electron-hole recombination rate was accounted for by metal doping [1] with the ethanol molecule acting as a hole trap. An increase in the hydrogen production rate was found as a result of the percentage of metal on doped titania and optimisation of experimental conditions with rate values being superior to recently published literature data [2].
Particle size, reactive surface area, structure and crystallinity of the semiconductor were found to be determinant in the production of highly photoactive titanium dioxide.
Research in progress includes development of catalyst that allows effective utilization of visible light and design of an experimental reactor.

References

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