

Catalytic and Magnetic Properties of Yellow and Red Iron Oxide for Water Splitting

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Abstract

The commercial red iron oxide (Fe_2O_3) and hydrated yellow iron oxide ($\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$) powders were characterised for catalytic and magnetic properties for water electrolysis. The structural and morphological properties were determined by X-ray diffraction, Scanning Electron Microscopy and Transmission Electron Microscopy. The mixed phase of *alpha* and *gamma* iron particles is found in the yellow iron oxide. The X-ray fluorescence and EDAX revealed the elemental composition of the iron oxide samples. The optical characterisations were performed by Photo Luminescence (PL), UV-absorbance and reflectance by Diffuse Reflectance Spectroscopy. The temperature dependant magnetic properties were studied by Variable Sample Magnetometry (VSM), which revealed only red iron oxide exhibits ferromagnetic properties. Electrocatalytic properties of red and yellow iron oxide were characterized by various techniques such as CV, Linear Sweep Voltametry (LSV) and impedance spectroscopy. Thermo gravimetric analysis revealed 7 % weight loss for yellow iron oxide. The as-received iron oxide samples were annealed at 600 °C and similar characterizations were performed. The electrocatalytic behaviour in terms of polarization in iron oxide will be presented in detail.

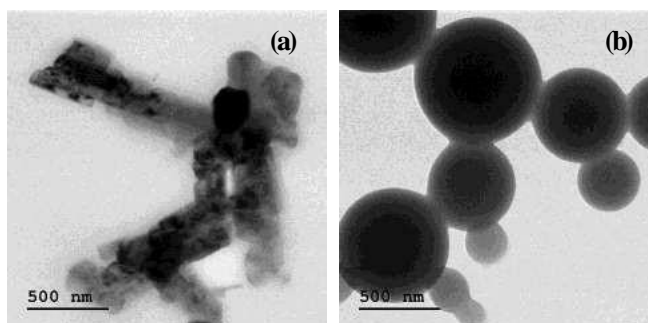


Figure: TEM image of (a) Yellow iron oxide and (b) Red iron oxide