Influence of IIIA group element impurities on the photo-electric properties of nanocrystalline hematite

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The actual dependence on fossil fuels and its most likely shortage in the next decades brings increasing concerns to the scientific, political and civil society. For these reasons, research on renewable energy technologies has strongly increased, namely in photovoltaics (PV). [1] α - Fe_2O_3 (hematite) is regarded as a promising system because of its narrow indirect bandgap energy (E_g) of approximately 2.1 eV, which lies well within the visible spectrum, as well as its low cost, electrochemical stability, and environmental compatibility. [2] Unfortunately, pure-phase hematite is a charge transfer-type Mott insulator with intrinsically poor conductivity (by small polarons) which limits the quantum efficiency for any photoelectrochemical process. [3]

To improve hematite's intrinsic electronic properties we have dopped it with IIIA group elements in different contentrations. Nanocrystalline dopped hematite was obtained by solution pyrolysis on FTO glass. Fotoactivity and Mott-Schottky analysis has been obtained to characterize dopped samples. Maximum increase of fotoactivity has been observed in all of dopped samples. To provide clarity of causes, additional characterization methods has been used – SEM, RDX, EDAX e.t.c.

Participation is supported by ERAF project No. 2015/0014/2DP/2.1.1.2.0/14/APIA/VIAA/010

References

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