

Design of process to stabilize metal - zirconia hetrostructures and their application

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Abstract: Zirconia has attracted lots of researcher interest because of its potential application in various fields of electro-optical materials, oxygen sensing, catalytic aspects, fuel cells, and electrochemical capacitor electrodes [1]. It is well known, ZrO_2 is found in three polymorph, as function of temperature: monoclinic (m), tetragonal (t) and cubic (c). Monoclinic phase is stable below 1172 °C, whereas tetragonal phase is an intermediate phase stable between 1172 °C – 2347 °C, and transforms into cubic phase at temperature above 2347 °C [2]. It is known that monoclinic ZrO_2 (m- ZrO_2) have negatively charged surface which is favorable for metal ion absorption. Here, we have shown the various process of group IB metal ion absorption followed by reduction of metal ion to pure metal nanoparticles via chemical route. This process leads to the formation of metal zirconia hetro-structure. The powder x-ray diffraction and microscopic studies confirmed formation of ZrO_2 nanoparticles of 30 nm. The Diffused Reflectance Spectroscopy studies confirm the considerable reduction in band gap after doping group IB metal ion (5.1 to 3 eV). The detail structural and microscopic study of metal-zirconia hetro-structures along with their application in field of thermal stability and photocatalytic activity have been shown.

References:

- [1] A.A. Tsyganenko, V.N. Filimonov, Infrared spectra of surface hydroxyl groups and crystalline structure of oxides, *J. Mol. Struct.* 19 (1973) 579–589. doi:10.1016/0022-2860(73)85136-1.
- [2] K.K.Yadav, A. Gupta, M. Sharma, N. Dabas, A.K.A.K. Ganguli, M. Jha, No Title, *Mater. Res. Express.* 4 (2017) 105044. doi:10.1088/2053-1591/aa9231.

Biography: Krishna Kumar Yadav received his B.Sc. in physics from Gorakhpur University. He completed his M.Sc. (Specialization in Electronics) degree (2012). He is working as Research Scholar at Institute of Nano Science and technology. His research interests include nanomaterials, field emission, electrochemistry, anti-corrosion and high temperature XRD.