Microstructure and Electrical Properties of Metal Oxiden doped ZnO Polycrystalline Ceramics

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**Abstract**

ZnO based polycrystalline materials are widely used in varistors, photosensitive, conductance and thermoelectric devices. There are several intrinsic defects in ZnO, the main type is doner-like zinc interstitials (Zni) and oxygen vacancies (VO), and acceptor-like zinc vacancies (VZn) zinc vacancies (VZn) and oxygen interstitials (Oi) .The electric properties of ZnO polycrystalline ceramics can be modified by doping ZnO, MgO, Al2O3, TiO2 etc. When ZnO doped with Al2O3, TiO2, it will form the ZnO main phase and second spinel phase, each solid compound has a single phase within a certain range, and both intrinsic and extrinsic defects co-exist in ZnO main phase. In this report, metal oxide doped ZnO-based conductive were prepared by the conventional solid state reaction sintering and SPS sintering method, respectively. Compared with solid phase sintering, the grain size of ZnO polycrystalline Ceramics via SPS sintering is smaller, and the electrical conductivity of samples prepared with SPS was 29.39 s/m, and the carrier concentration was 100 times higher than that of solid state reaction sintering. RAMAN spectroscopy and PL spectrum analysis showed an increasing of the donor defect zinc interstitial (Zni), leading to the increasing of conductive electron and the reducing of electric conductivity.