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Microstructure and Electrical Properties of TiO2 doped ZnO ceramics via spark plasma sintering

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ZnO based ceramics 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 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, TiO2 doped ZnO-based conductive ceramics with the composition of 99.5 mol%ZnO+0.5 mo%TiO2 were prepared via SPS method and the conventional solid state reaction sintering method, respectively. Compared with solid phase sintering, the grain size of ZnO-based ceramics via SPS 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.

Kindly invited.