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EFFECT OF γ-RAYS ON THE STRUCTURE AND ELECTRICAL PROPERTIES OF ZnO/TiO_2 CERAMICS

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A number of recent studies concern the phase diagram and characterization of the ZnO-TiO_2 system. This system attracts the attention of researchers because of its importance in practical applications [1-5].

ZnO/TiO_2 powders were synthesized by sol-gel method using zinc chloride and titanium chloride in molar ratio of 1:1as reactants. Ammonium hydroxide was used to precipitate Zn^{2+} and Ti^{2+} cations as hydroxides simultaneously. **T**he hydroxide precursor powder was calcined at various temperatures ranging from 500-1000°C for constant time of 6 h. The as-prepared material was irradiated using γ-rays ^{60}Co at different doses. The phase content and lattice parameters and effect of radiation were studied by the powder X-ray diffraction. The particle size and morphology were studied by SEM.

The characteristics of the ZnO/TiO_2 samples were found to depend on the calcination temperature and irradiation dose. Heating at 500°C led to a mixture of Ti_3O_5 (monoclinic), $ZnTiO_3$ (rhombohedral) with addition of a few extra lines of other oxides as secondary phases. With increasing the temperature to 1000°C we observe the changes of the phase composition during the process manifested by changes in X-ray diffraction pattern from the mixture.

The γ-irradiation is found to significantly influence the structure of the irradiated solid. The system shows a decrease in the crystallite size from 130 nm to 63 nm for sample irradiated. Moreover, this treatment resulted in a significant increase in the electrical conductivity (10^2-10^3-fold) of the material.

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