

# High specific heterocontacts of p-CuO/n-ZnO thin film composites for enhanced sunlight absorption

## Abstract

This study is focused on investigating the heterocontacts development between p-CuO and n-ZnO semiconductor composite for enhancing its sunlight absorption. CuO and ZnO are chosen as precursors due to their many potentials. High absorption of sunlight is one of the most important criteria in photovoltaic (PV) device. However poor crystal structure and low contact surface between the p and n semiconductors limits the light intake and is due to several factors. To carry out intensive study on the mechanism of the heterocontact growth, CuO:ZnO thin film is synthesized by mechanical alloying process using high energy ball mill (HEBM) followed by sol gel technique. Three parameters were studied; sol-gel's surfactant to solvent ratio, annealing temperature and annealing duration. The homogeneity and compounds' distribution of the composite is analysed by EDS analysis and structural characterization is done with XRD analysis. The UV-VIS analysis is done to determine the light absorbance and the bandgap of the composite. The initial mechanical centrifugation HEBM has aided the process for homogenizing the composite and boost the heterointerface between the semiconductors by mechanochemical effects such as phase transformations and solid-state reactions. EDS analysis reported that 500 C annealed specimen giving the lowest percentage of ratio gap than others temperature and the heterocontact surface between molecules of material also increased. Uv-Vis analysis also agrees with EDS, showing the specimen having highest absorbance spectra. However, bandgap narrowing occurred in the specimen, as resulted by the coexistence of transitional metal Cu in the composite system. XRD analysis shows a near single oriented crystal growth which promotes clean growth of crystal structure and hypothetically reduce the presence of unwanted voids and large boundaries.