

Improved Cu₂O/AZO Heterojunction by Inserting a Thin ZnO Interlayer Grown by Pulsed Laser Deposition

A. Boughelout, R. MACALUSO, I. CRUPI, B. MEGNA, M. S. AIDA, M. Kechouane

Abstract: Cu₂O/ZnO:Al (AZO) and Cu₂O/ZnO/AZO heterojunctions have been deposited on glass substrates by a unique three-step pulsed laser deposition process. The structural, optical, and electrical properties of the oxide films were investigated before their implementation in the final device. X-ray diffraction analysis indicated that the materials were highly crystallized along the c-axis. All films were highly transparent in the visible region with enhanced electrical properties. Atomic force and scanning electron microscopies showed that the insertion of a ZnO layer between the Cu₂O and AZO films in the heterojunction enhanced the average grain size and surface roughness. The heterojunctions exhibited remarkable diode behavior and good rectifying character with low leakage current under reverse bias. The presence of the ZnO interlayer film significantly reduced the parasitic and leakage currents across the barrier, improved the quality of the heterostructure, made the energy band between AZO and Cu₂O layers smoother, and eliminated the possibility of interface recombination, leading to much longer electron lifetime.

Keywords : Heterojunctions, ZnO, Cu₂O, AZO, pulsed laser deposition, solar cells