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Fabrication and Characterizations of Aluminum-Doped Zinc Oxide (AZO): Cu2O/p-Si Photodiodes

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Abstract

In this paper, aluminum-doped zinc oxide (AZO):Cu2O/p-Si photodiode was fabricated based on simple solution process. The photodiodes were prepared using Zn1-xAlxO:Cu2O thin films grown on p-Si substrates. The photoresponse properties of the p-Si/AZO:Cu2O/Al photodiodes were investigated by current-voltage and capacitance-conductance-voltage characteristics under solar light. The photoconducting mechanism of the diodes were analyzed by the transient photocurrent measurements. It was found that the photoconductivity mechanism is controlled by the continuous distribution of trap levels. The diodes exhibited the photocapacitance and are changed with increasing Cu2O content. The presence of the interface states in the interface of the diodes was confirmed by the series resistance-voltage behavior. The obtained results indicate that the p-Si/Zn1-xAlxO-Cu2O/Al diodes can be used as a photosensor in optoelectronic applications.

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