

Design of a Gas Sensitive Transparent Heterojunction -the system SrCu₂O₂-ZnO-

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Abstract

Copper strontium oxide (SrCu₂O₂) was deposited on highly oriented polycrystalline n-type ZnO to fabricate transparent oxide p-n heterojunction diodes. Zn-terminated polar plane (Zn-face), O-terminated polar plane (O-face), and non-polar plane (A-face) of polycrystalline ZnO plates were used as substrate to clarify the effect of surface polarity of ZnO upon the p-n heterojunction characteristics. Copper strontium oxide (SCO) is well crystallized and three-dimensionally grown on Zn-face during postdeposition annealing, while no crystalline SrCu₂O₂ phase was detected on A-face ZnO. These results suggest that surface activity of ZnO strongly affect the crystal quality of SrCu₂O₂ film. The junction between SCO and O-terminated ZnO polar surface exhibited clear rectifying I-V characteristics after postdeposition annealing at 923K in Ar, where the junction between SCO and Zn-terminated surface shows poor rectifying character. The origin of the variation in the I-V characteristics depending on the crystal axis orientation of the ZnO substrates is guessed to be due to the surface polarity of the ZnO surface. The surface polarity of ZnO are known to affects the gas sensing properties of the ZnO based heterojunction. The gas sensing characteristics of the SCO/ZnO heterojunction are evaluated and the effect of crystal axis orientation of ZnO substrate on the gas sensing characteristics of the junction is also discussed.