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Jeung Sun Ahn, Ramchandra Pode, Kwang Bae Lee

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Stoichiometric p-type Cu₂O thin films prepared by reactive sputtering with facing target

Jeung Sun Ahn^a, Ramchandra Pode^a, Kwang Bae Lee^{b*}

^a Department of Physics, Kyung Hee University, Dongdaemun-gu, Seoul 02453, Republic of Korea

^b Department of Applied Physics & Electronics, Sangji University, Wonju, Gangwondo 26339, Republic of Korea

We have investigated the high quality p-type Cu₂O thin films produced by the post vacuum annealing process of Cu₂O thin films deposited on glass substrates at room temperature by facing target sputtering. As-deposited stoichiometric films show the high Cu₂O (111)-axis orientation with the minimum value of electrical resistivity of 17 Ωcm. Furthermore, the XRD peaks intensities continuously decrease around the stoichiometric 2θ value of 36.4° with increasing the O₂ partial pressure. With the vacuum annealing at 550 °C with optimized oxygen ambient, the high quality p-type Cu₂O thin film could be obtained. The highest value of Hall mobility μ_H of 61 cm²/Vs is obtained for a vacuum annealed stoichiometric p-type Cu₂O thin film. Such high value of μ_H in the described stoichiometric p-type Cu₂O thin film is believed to be due to the minimized oxygen vacancies induced by optimized vacuum annealing of a stoichiometric as-deposited Cu₂O thin film.

Keywords:

p-type Cu₂O thin film; facing target sputtering; stoichiometry; vacuum annealing; Hall mobility

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