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Inductively coupled plasma assisted RF magnetron sputtering synthesis of n-/p-type ZnO QIJIN CHENG, The University of Sydney, SHUYAN XU, SHIYONG HUANG, BISHUANG CHUA, JIDONG LONG, Nanyang Technological University, EUGENE TAM, The University of Sydney, KOSTYA OSTRIKOV, CSIRO, PLASMA SOURCES AND APPLICATION CENTER TEAM, PLASMA NANOSCIENCE TEAM — Al- and N-doped ZnO thin films have been deposited on glass substrates using an inductively coupled plasma assisted RF magnetron sputtering deposition system. The electrical, optical and structural properties of the deposited films have been investigated using various characterization tools. At the optimum deposition conditions, room-temperature Hall effect measurements show that Al-doped ZnO is n-type with an electron concentration of 3.74 x 10^{18} cm^{-3} and mobility of 1.42 $cm^2V^{-1}s^{-1}$, while the N-doped ZnO is p-type with a hole concentration of 3.32 x 10^{18} cm^{-3} and mobility of 1.31 $cm^2V^{-1}s^{-1}$. XRD measurements show that both of Al- and N-doped ZnO films are polycrystalline with the hexagonal structure, having a strong (002) preferential growth orientation. The two-layer structured ZnO $p-n$ homojunctions have been fabricated on a glass substrate by depositing the Al-doped n-type ZnO film on the N-doped p-type ZnO film. The current-voltage measurements reveal a typical diode characteristic with a turn-on voltage at about 1.2 V under forward-biased voltage and a low leakage current under reverse-biased voltage.

Qijin Cheng
The University of Sydney

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