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NiO has p-type semiconducting property with bandgap of 3.6-4.0 eV [1], and it is cheap and environment-friendly with excellent electrical and optical properties for various applications such as alkaline batteries, electrochemical capacitors, smart windows, and magnetic bar codes. NiO thin film has been prepared by several methods; sol-gel process, spray pyrolysis, high temperature oxidation, pulse laser deposition, and magnetron sputtering [2]. In this study, NiO thin films were deposited using a NiO alloy target by radio frequency magnetron sputtering which has several advantages such as superior adhesion of thin films and easy control for deposition rate. Moreover, the 4f rare earth atoms, such as Nd, can have larger magnetic moment to enhance the ferromagnetism by incorporating metal oxide matrix in semiconductors [3]. The NiO thin films were doped with various concentrations of Nd³⁺ ions by co-sputtering method. The precursors with various concentration of Nd were annealed by rapid thermal annealing (RTA) to control the properties of the NiO:Nd thin films. Structural and morphological properties of the thin films were analyzed by using X-ray diffraction and atomic force microscope. Optical and electrical characteristics of the thin films were analyzed by using an UV-Visible spectrophotometer and a Hall effect measurement system. Electrochemical capacitive behavior of the thin films was determined by using a potentiostat. The magnetic properties of NiO:Nd thin films were analyzed by vibrating sample magnetometer.

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