

**【T-30】**

**Enhancement of photoluminescence and electrical properties of Ga-doped ZnO thin film grown on  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>(0001) single crystal substrate by RF magnetron sputtering through rapid thermal annealing**

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Ga<sub>2</sub>O<sub>3</sub> (1wt%)-doped ZnO (GZO) thin films were deposited on  $\alpha$ -Al<sub>2</sub>O<sub>3</sub>(0001) by rf magnetron sputtering at 550°C and polycrystalline crystalline structure. As-grown GZO thin film shows poor electrical properties and photoluminescence (PL). For the improvement of these properties, GZO thin films were annealed at 800-900°C in N<sub>2</sub> atmosphere for 3 min. After rapid thermal annealing, deep defect-level emission disappears and near-band emission is greatly enhanced. Annealed GZO thin films show very low resistivity of  $2.6 \times 10^{-4} \Omega\text{cm}$  with  $3.9 \times 10^{20}/\text{cm}^3$  carrier concentration and exceptionally high mobility of 60 cm<sup>2</sup>/Vs. These improved physical properties is explained in terms of translation of doped-Ga atoms from interstitial to substitutional site.