Obtaining p-type ZnO films by the RBQE method

ABSTRACT. We have investigated ZnO layers obtained by the radical beam quasi epitaxy (RBQE) method. p-type ZnO epitaxial layers were obtained at $T = 400 \, ^\circ\text{C}$, and Hall effect measurements carried out at $T = 77 \, \text{K}$ and $300 \, \text{K}$, at which the resistivity was measured as $\rho = 5 \times 10^{-2} \\Omega \, \text{cm}$ and $3.1 \times 10^{-3} \\Omega \, \text{cm}$ respectively. At $T = 77 \, \text{K}$, the hole concentration and mobility was $5 \times 10^{18} \, \text{cm}^{-3}$ and $22 \, \text{cm}^2 \, \text{V}^{-1} \, \text{s}^{-1}$, respectively, becoming $8 \times 10^{18} \, \text{cm}^{-3}$ and $250 \, \text{cm}^2 \, \text{V}^{-1} \, \text{s}^{-1}$ at $T = 300 \, \text{K}$. In the photoluminescence (PL) spectra of p-type ZnO layers bands were observed and identified at $\lambda = 369.1 \, \text{nm}$, $\lambda = 374.5 \, \text{nm}$, $\lambda = 383.5 \, \text{nm}$, $\lambda = 392.5 \, \text{nm}$ and $\lambda = 401 \, \text{nm}$ (at 70 K). It is shown that RBQE technology yields highly monocrystalline ZnO samples with a low concentration of uncontrollable impurities.


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