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Electronic Transport Properties of Epitaxial ZnO Films by Electron Dephasing and Mobility Spectrum Analysis KUI ZHANG, WEI GUO, MICHAEL KATZ, Department of Materials Science and Engineering, University of Michigan, Ann Arbor, MI 48109, TASSILO HEEG, DARRELL SCHLOM, Department of Materials Science and Engineering, Cornell University, Ithaca, NY 14853, MINGRUI HAO, WENZHONG SHEN, Department of Physics, Shanghai Jiao Tong University, Shanghai 200240, China, XIAOQING PAN, Department of Materials Science and Engineering, University of Michigan, Ann Arbor, MI 48109 — Epitaxial ZnO films were grown by pulsed laser deposition on (111) Si substrates with bixbyite oxide buffers. Carrier transport properties were investigated using Hall measurements (4–300 K) under magnetic fields of 0–10 T, indicating mobility up to $113 \text{ cm}^2/\text{Vs}$. A diffusive Fermi surface (DFS) model incorporating electron dephasing theories was used to fit the abnormally positive magneto-conductivity observed below 150 K. Quantitative mobility spectrum analysis revealed the presence of a hole group at lower mobility accompanying the major electron group. Geometric distribution of the conducting groups was examined by capacitance-frequency experiments, while both temperature-dependent photoluminescence and mobility fitting confirmed a donor binding energy of $\sim 60 \text{ meV}$.

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