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Pump-Probe studies of Carrier Dynamics in bulk ZnO and ZnO epilayers and Nanorods[1] X. WANG, Y.D. JHO, D.H. REITZE, C. COOK, G.D. SANDERS, C.J. STANTON, Department of Physics, University of Florida, X. WEI, National High Magnetic Field Laboratory, J.K YOO, G.-C. YI, Department of Materials Science and Engineering, Pohang University of Science and Technology — ZnO-based devices are potentially useful as short wavelength emitters and in spintronics applications, yet little is known about the ultrafast relaxation properties of ZnO. We have performed time-resolved differential reflectivity (TRDR) measurements of bulk ZnO, ZnO epilayers and nanorods as a function of temperature and excitation wavelength. Bi-exponential decays of the A and B exciton states are observed with fast (∼ps scale) and slower (∼ 50-100 ps scale) components, which depend strongly on excitation wavelength. We find that decay times can be correlated with relaxation channels in the band structure. In addition to their bi-exponential nature, the relaxation times we observe on ZnO epilayers and nanorods are shorter than high quality bulk ZnO, indicating a higher density of defects and impurity states in these samples.

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