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Magnetooptic Ellipsometry: Determination of free charge carrier properties in semiconductor device structures[1] MATHIAS SCHUBERT, TINO HOFMANN, Dept. of Electrical Engineering and Nebraska, University of Nebraska-Lincoln — The standard tool for the electrical characterization of free charge properties in semiconductor layer structures is the electrical Hall effect. However, besides the requirement for electrical contacts, the application of this technique to investigate complex heterostructures is very difficult and reliable deconvolution of the individual layer contributions to the measured Hall-Voltage virtually impossible. In our contribution we show that magnetooptic ellipsometry at long wavelengths when applied to conducting or semiconducting multilayer structures can yield equivalent and even much increased information. Our technique allows the independent measurement of free charge carrier density, type, mobility, and effective mass including anisotropy without any electrical contact in buried structures, and which may have been inaccessible to any true electrical evaluation thus far. We present results for multilayer AlGaP and GaInP samples with different doping concentrations. Furthermore, multilayer LED device structures were investigated and we demonstrate that magnetooptic ellipsometry allows deconvolution of the individual free charge carrier contributions of the p- and n-type regions of the device structure. We predict a realm of applications for magnetooptic ellipsometry in future materials research and engineering.

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