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Magnetoresistance Phenomena in a Variety of Amorphous Semiconductors and Insulators[1] MICHAEL MUTCH, DAVID WESTLEY, PATRICK LENAHAN, Pennsylvania State University, SEMICONDUCTOR SPECTROSCOPY LAB AT PENN STATE UNIVERSITY TEAM — We report on near zero-field magnetoresistance (MR) phenomena in a variety of amorphous semiconductors and insulators. We utilize electrically detected magnetic resonance (EDMR) measurements at multiple fields and frequencies to complement MR measurements. EDMR, the electrically detected analog of electron paramagnetic resonance (EPR), provides both information about the chemical nature and energy levels of point defects involved. Semiconductors in this study include a-BC:H, a-C:H, diamond-like carbon (DLC), and a-Si:H. Insulators include a-SiN:H, a-SiOC:H, a-SiCN:H. In hydrogenated amorphous systems, near featureless EPR and EDMR spectra are often difficult to analyze. We utilize multiple field and frequency EDMR results including ultra-low field/frequency (ν = 85 MHz, B = 3 mT) EDMR measurements to provide insight into defect chemistry in these systems. We have also made EDMR and MR conditions over a wide range of metal/semiconductor heterojunction and metal/insulator/semiconductor biasing conditions. By comparing variable bias measurements with band diagrams, we gain an elementary understanding of defect energy levels. We believe our results will be of significant importance for understanding defect mediated spin-dependent transport in these systems.

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