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Spectroscopic Evidence for "Optically Relevant Defects" in the Optically-Pumped NMR of Semi-Insulating GaAs SOPHIA HAYES, KANNAN RAMASWAMY, Washington University, XINGYUAN PAN, CHRISTOPHER STANTON, University of Florida — We probe the interaction of electrons localized at "optically-relevant" defect sites in GaAs on the surrounding Ga nuclear spins. Simulations of the spatial dependence of nuclear spin polarization have been employed to map the origin of the different lineshapes, and these follow the both the size and sign (spin orientation) of the electron spin polarization. Optically pumped NMR (OPNMR) provides information about electron-nuclear hyperfine interactions in such systems can be derived by measuring dynamic processes (e.g., nuclear spin relaxation) and static processes (e.g., hyperfine shifts). NMR lineshapes also provide insights into the spatial extent of such hyperfine interactions. In III-V cubic semiconductors, the broadening of conventional NMR spectra can arise from a number of factors. The lineshapes of ^{69}Ga spectra of semi-insulating GaAs (si-GaAs) under optical pumping conditions exhibit additional broadening, which was theoretically predicted in earlier work, although not experimentally observed. In this presentation, we discuss the experimental observation of such OPNMR lineshapes, in addition to spatial mapping the nuclear polarization around the site of electron localization at an optically-relevant defect, such as substitutional defects in the si-GaAs lattice.

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