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Magnetic Resonance Characterization of Defects in Icosahedral and Cubic Boron Arsenide Bulk Crystals

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Low-temperature electron spin resonance (ESR) at 9.5 GHz and optically-detected magnetic resonance (ODMR) at 24 GHz were employed to investigate point defects in icosahedral and cubic Boron Arsenide bulk crystals. These semiconductors are of interest for use in high radiation and/or high temperature environments. ESR of the (001) $B_{12}As_2$ (E_g = 3.47 eV) mm-size platelets revealed two distinct features of unknown origin. The first signal is characterized by Zeeman splitting g-values of $g_{||}$ = 2.017, $g_{\perp}$ = 2.0183 while the second with $g_{||}$ = 2.0182, $g_{\perp}$ = 1.9997. Most notably, the second signal was also observed from ODMR on the broad 2.4 eV "yellow/green" photoluminescence band previously reported[1] for these crystals and suggests its direct involvement in this likely defect-related radiative recombination process. Preliminary ESR obtained for the 100-300 micron-size cubic BAs crystals[2,3] revealed a signal with g-value of 2.018 (very similar to that found for the $B_{12}As_2$ crystals) and broad FWHM value of 182 G. Possible origins of these defects will be discussed. [1]P.B. Klein et al., J. Appl. Phys. **112**, 013508 (2012). [2]Bing Lv et al., Appl. Phys. Lett. **106**, 074105 (2015). [3]Jaehyun Kim et al., Appl. Phys. Lett. **108**, 201905 (2016).

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