Single crystal EPR and ENDOR study of CsBr:Eu^{2+} in X and Q-band

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Solids doped with rare earth ions are presently being used in numerous optical applications, e.g. laser crystals [1], dosimetric systems [2], etc. In various phosphor applications, as for electroluminescent flat screens [3] for optical or X-ray storage [4], Eu^{2+} is the optical dopant of choice.

In alkali halides with the NaCl-structure, Eu^{2+} has been investigated with Electron Paramagnetic Resonance (EPR) [5] and the existence of a vacancy-compensated Eu^{2+} centre has been demonstrated. However, hardly any EPR studies on Eu^{2+} have been reported for CsCl-type lattices.

For the present work we study Bridgman-grown CsBr:Eu single crystals, with EPR and Electron Nuclear Double Resonance (ENDOR) in X and Q-band (9.5 and 34 GHz). Before any treatment, no EPR signals are detected. After vacuum annealing at 500°C, signals of isolated Eu^{2+} ions can be recorded in the temperature range 10-60K. Interactions of the unpaired electrons with ^{133}Cs, $^{79}Br/^{81}Br$ and $^{151}Eu/^{153}Eu$ nuclei are identified in the ENDOR spectra.

Inspired by the work in the alkali halides with the rock salt structure, the possible aggregation behaviour of Eu^{2+}-Vacancy dipoles is studied by in situ pulse annealing at temperatures up to room temperature.

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