

Abstract Submitted
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Motional averaging of quadrupole interactions in Al_4Sr and Ga_4Sr studied using PAC¹ SAMANTHA CAWTHORNE, Clemson University, GARY S. COLLINS, Washington State University — Perturbed angular correlation of gamma rays (PAC) was used to study diffusion of $^{111}\text{In}/\text{Cd}$ probe atoms in Al_4Sr and Ga_4Sr phases. These phases have the tetragonal Al_4Ba structure, with two inequivalent Al sublattices that have axially symmetric and collinear electric field gradients. Measurements of nuclear quadrupole interactions in each phase revealed three dynamical regimes. Static quadrupole interactions were observed below 500°C . Between 500 and 700°C , the two quadrupole interaction signals were observed to approach each other and merge at 700°C (slow fluctuation regime). Only a single quadrupole interaction signal was observed above 700°C (fast fluctuation regime). These changes are attributed to jumping of probe atoms between the two sublattices, leading to motional averaging of the two electric field gradients as temperature and jump frequency increase. The two signals merge at a temperature at which the jump frequency between the sublattices is equal to the difference in the static quadrupole interaction frequencies. Temperature dependences of the quadrupole interaction frequencies will be contrasted with those measured earlier on phases including Al_4Ba and In_4Ba .

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