

Abstract Submitted  
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**Jump frequencies of tracer atoms on Al-sites in Al<sub>4</sub>Ba phases**

RANDAL NEWHOUSE, GARY S. COLLINS, Washington State University, Pullman, WA — The Al<sub>4</sub>Ba structure has two inequivalent Al sites with collinear electric field gradients (EFGs) of unequal magnitude. Nuclear quadrupole interactions (NQIs) were measured at <sup>111</sup>In/Cd probe atoms in Al<sub>4</sub>Ba, In<sub>4</sub>Ba and Al<sub>4</sub>Eu phases using perturbed angular correlation spectroscopy (PAC). The probes were found to occupy both Al-type sites. At low temperature, two NQI frequencies were detected that, with increasing temperature, approached each other and merged at ~400 °C, above which only a single NQI was observed. This is attributed to rapid jumping of probe atoms between the Al-sites, leading to motional averaging of the EFGs. Merging occurs at the temperature for which the jump frequency equals the difference between static NQI frequencies. Since differences in static frequencies were all about 20 Mrad/s, we conclude that the jump frequencies equaled about 3 MHz at ~400 °C in each phase. This type of motional averaging differs from motional averaging through reorientation of EFGs observed in previous work [Phys. Rev. Lett. 92, 225901 (2004)]. *This work was supported in part by the NSF under grant DMR 05-04843 (Metals Program).*

Randal Newhouse  
Washington State University, Pullman, WA

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