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Atomic ordering in ternary phases having the Al_4Ba structure
LEE ASPITARTE, XIANGYU YIN, RANDAL NEWHOUSE, GARY S. COLLINS, Washington State University — Al_4Ba is by far the most common intermetallic structure that has a 4:1 ratio of constituent elements. There is one Ba-site and two inequivalent Al-sites. Experiments were carried out to measure quadrupole interactions at dilute ^{111}In/Cd probe atoms using perturbed angular correlation spectroscopy (PAC) for a number of ternary phases based on Al_4Ba. One was a sample having composition In_2Al_2Ba, with end-member phases Al_4Ba and In_4Ba both having the Al_4Ba structure. The PAC spectrum exhibited two broadened quadrupole interaction signals, indicating that Al and In atoms do not order on the two sublattices. Instead, they appear to locate more or less randomly on the two sublattices, making a "pseudo-binary" Al_4Ba phase. The other sample was $BaNiSn_3$, for which it has been reported that Ni-atoms order on half of one of the two Al-sublattices. Indium was expected to prefer to occupy sites of chemically-similar Sn, of which there are two types: one having a quadrupole interaction that is axially symmetric and the other one having lower symmetry. Experiment showed only one signal for a low-symmetry site, but with excellent signal coherence. It is concluded that there is a high degree of atomic ordering in $BaNiSn_3$ and that indium impurities in the phase occupy only one of two inequivalent Sn-sites. *Supported in part by the NSF under grant DMR 09-04096 (Metals Program).*

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