

Abstract Submitted
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Lattice Monte Carlo Simulation Study Atomic Structure of Alnico 5-7 Permanent Magnets MANH CUONG NGUYEN, XIN ZHAO, CAI-ZHUANG WANG, KAI-MING HO, Ames Lab, U.S. DOE and Department of Physics and Astronomy, Iowa State University — The fluctuations and increases in price and the issues in supply recently of rare earth metals re-heated the sought for non-rare earth permanent magnets. Alnico permanent magnets have been considered as promising replacements for rare earth-based permanent magnets due to the superiors in the magnetic performance at high temperature and the abundances of the constituent elements. Using lattice Monte Carlo simulation in combination with cluster expansion method we study the atomic structure of alnico 5-7 permanent magnets. We observed the phase separation into FeCo-rich and NiAl-rich phases in alnico 5-7 at low temperature, which is consistent with experiment. The phase boundary between these two phases is quite sharp. Both FeCo-rich and NiAl-rich phases are in B2 ordering with Fe and Al sitting on α -site and Ni and Co sitting on β -site. The degree of order of NiAl-rich phase is quite higher than that of FeCo-rich phase and it decreases with temperature slower than that of FeCo-rich phase. We also observed a small and increasing with annealing temperature magnetic moment in NiAl-rich phase, implying that the magnetic properties of alnico 5-7 could be improved by lowering annealing temperature to diminish the magnetism in NiAl-rich phase.

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