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Small-Angle Neutron Scattering Study of Nanoscale Magnetic Inhomogeneity in the Off-Stoichiometric Heusler Ni50-xCoxMn40Sn10[1]
SAMI EL-KHATIB, American University of Sharjah, Sharjah, United Arab Emirates., VIJAY SRIVASTAVA, RICHARD D. JAMES, CHRIS LEIGHTON, University of Minnesota, Minneapolis, MN, United States. — Off-stoichiometric Heusler alloys of the form Ni50-xCoxMn25+ySn25-y have attracted much recent interest, from the fundamental perspective due to magnetic phase competition, and from the applied perspective due to potential shape memory, sensor, actuator, and energy conversion applications. Recently we applied Small-Angle Neutron Scattering (SANS) and NMR to this alloy system for the first time, directly observing the separation into interacting ferromagnetic and antiferromagnetic nanoscale spin clusters that explains bulk superparamagnetism and exchange bias. These prior SANS measurements were performed at the representative composition x = 6. In this work we expand this SANS study to x = 2 and 12, spanning the three main regimes in the Ni50-xCoxMn25+ySn25-y phase diagram. The results provide detailed information on the evolution in magnetic ordering and inhomogeneity with Co doping, most notably the persistence of nanoscale magnetic inhomogeneity even in the non-martensitic region, and the direct evidence found for separation of superparamagnetic and exchange bias blocking temperatures at some compositions. The results are discussed in terms of a compositional fluctuation picture.

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