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Reentrant spin-glass behavior and enhanced Curie temperature in epitaxial MnSi[1] ERIC KARHU, SAMER KAHWAJI, TED MONCHESKY, Dalhousie University, KRISTA RAFFEL, MICHAEL ROBERTSON, Acadia University, CHRISTIAN MAUNDERS, McMaster University — We grew single crystal MnSi(111) thin films on Si(111) substrates by molecular beam epitaxy. The 3% lattice mismatch created an in-plane tensile strain of $\varepsilon_{||} = 0.005 \pm 0.001$, as measured by transmission electron microscopy, and induced an out-of-plane compressive strain $\varepsilon_{\perp}$= -0.0033 ± 0.0001, as determined by x-ray diffraction. The MnSi(111) films displayed two magnetic phases. The first transition from a paramagnetic phase to a phase with long range magnetic order occurs with an enhanced Curie temperature $T_C = 40$ K as compared to bulk MnSi, which develops helical magnetic structure below $T_C = 29.5$ K. This increase in T_C can be explained by an in-plane strain. A second phase transition to spin glass, below $T_f = 35$ K, maybe due to geometric frustration created by the compressive out-of-plain strain. We propose a relationship between the reentrant spin-glass behavior and the partial magnetic order reported for bulk MnSi under pressure.

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