Spin model for inverse melting and inverse glass transition

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An interacting spin system that yields inverse melting is presented and analyzed. The Blume-Capel model, for spin-one particles with low-energy inert (zero) state and exchange interactions, is extended to include many $|S| = 1$ states for each spin. The larger entropy associated with the paramagnetic phase yields an (first and second order) inverse melting transition, with a phase diagram that resembles the experimental results. Motivated by the appearance of a reversible thermogelation in Methyl-Cellulose solution, the model is considered for random exchange interactions using the replica trick. The results are shown to differ qualitatively from those obtain by Ghatak and Sherrington, and inverse freezing of various types is exhibited.

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