

DILUTION DEPENDENCE OF ORDERING TEMPERATURE IN AN INSULATING 3D-XY FERROMAGNET

Bis(diethylselenocarbamate)iron(III) chloride is perhaps the only known three-dimensional XY ferromagnet among insulating materials. In this work it has been diluted up to 20.2% with diamagnetic bis(diethyldithiocarbamate)zinc(II). Susceptibility measurements yield the ferromagnetic ordering temperature, shown as a function of composition in the accompanying graphic. Remarkably, this quantity decreases much less rapidly with dilution than predicted for any standard model; the least rapidly decreasing 3D-Ising model case is the line in the graphic. A change in curvature appears near 14% dilution. Extensions of simple models of dilution do not account for the results. It is possible that molecular shape factors lead to effective nonrandom dilution, so that certain ferromagnetic interactions survive unexpectedly, thus raising the ordering temperature relative to the ideal random case.