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Stability of the $Ni_3V_2O_8$ phase diagram on substitution with magnetic and non-magnetic transition metal ions AKILA KUMARASIRI, AMBESH DIXIT, GAVIN LAWES, Wayne State University — There is considerable interest in understanding the materials properties underlying the development of simultaneous magnetic and ferroelectric order in multiferroics. $Ni_3V_2O_8$ develops strongly coupled ferroelectric and antiferromagnetic order simultaneously at low temperatures and has a rich magnetic phase diagram due to competing magnetic interactions. We investigated how the magnetic phases of $Ni_3V_2O_8$ were affected by systematic doping by transition metal ions. For these studies, polycrystalline $Ni_3V_2O_8$ samples substituted by various concentrations of transition metal ions M (M = Zn, Cu, Co, Mn, Fe) were prepared. Heat capacity, magnetization, dielectric, AC susceptibility, and pyrocurrent measurements were used to track the change in phase transition temperatures. On doping with spin-0 Zn, the system behaves as expected for site dilution consistent with 2-D spins, where the phase transition temperatures are suppressed linearly to lower temperatures. The modifications to the phase diagram for magnetic dopants (Co, Cu, Mn and Fe) show more variation, but the multiferroic phase transition appears to persist over a range of concentrations. This suggests that the specific spin structure in $Ni_3V_2O_8$ responsible for the development of ferroelectric order is relatively robust against perturbations produced by both magnetic and non-magnetic dopants.

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