

The effects of substitutional impurities on the magnetic, electronic, and hyperfine interactions in ilvaite, $\text{CaFe}_3\text{Si}_2\text{O}_7\text{O}(\text{OH})$, a mixed-valence iron silicate (abstract)

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Ilvaite, a mixed-valence iron silicate, rivals magnetite in the complexity of the phenomena exhibited in connection with the simultaneous occurrence of Fe^{2+} and Fe^{3+} on equivalent sites. Inasmuch as the effects of impurities on the several phase transitions and electron delocalization have been explored little, if at all, an investigation of the effect of manganese impurities by means of measurements on a large suite of samples has been undertaken. Significant variations in magnetic properties are observed even for low impurity levels. For a Mn^{2+} content of 0.5 wt %, the low temperature magnetic phase transition is at ~ 40 K, for a Mn^{2+} content of 1.2%, the transition temperature is less than 20 K and for a Mn^{2+} content of 4.5%, the transition appears to be well below 10 K. In addition to the quantitative variations, the $1/\chi$ versus T curves are qualitatively different for samples with different concentrations of manganese. The ^{57}Fe Mössbauer spectra are also qualitatively different at 298 K with pronounced differences in the resolution of the two Fe^{2+} patterns and in their relative intensities. In agreement with earlier reports, no evidence for magnetic ordering at 120 K has been observed in the susceptibility curves; the ordering is, however, exhibited in the ^{57}Fe Mössbauer spectra obtained at 82 K. The exploration of the effect of Mn^{2+} impurities has permitted rare insights to be gained on the relationship between the bulk and local, site-specific properties of ilvaite. Further progress is expected to result from electrical conductivity and x-ray diffraction measurements.

Determination of the interlayer superexchange in the two-dimensional ferromagnet $\text{Rb}_2\text{CrCl}_{4-x}\text{Br}_x$ by means of quasielastic neutron scattering (abstract)

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The 2D ferromagnets $\text{Rb}_2\text{CrCl}_{4-x}\text{Br}_x$; $x=0, 1, 2$ were studied by means of quasielastic neutron scattering. The compounds order between $T_c=52.2$ and 57.0 K. Rods of quasielastic diffuse scattering can be observed along the [001] direction. The wave vector dependent modulation of the width and the intensity of the diffuse scattering can be explained as resulting from the effect of the weak interplanar exchange coupling J' . By means of a mean field model, we describe the wave vector dependent susceptibility as function of the scattering vector components with respect to the reciprocal lattice vector. From the data around T_c , we derive that the ratio of the inter/intralayer superexchange changes from $J'/J=2.3 \times 10^{-4}$ to 10.2×10^{-4} upon increasing value of x .