Magnetic Phase Transition of the Mixed Antiferromagnets $Ni_{1-x}A_xCl_2{\cdot}2H_2O$ (A=Co, Mn)

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Mixed antiferromagnets $Ni_{1-x}Co_xCl_2{\cdot}2H_2O$ and $Ni_{1-x}Mn_xCl_2{\cdot}2H_2O$ were prepared. The crystal structure of $NiCl_2{\cdot}2H_2O$ is different from that of $CoCl_2{\cdot}2H_2O$ and $MnCl_2{\cdot}2H_2O$. It is a purpose to examine how Co or Mn spins in $NiCl_2{\cdot}2H_2O$ crystal structure behave.
We determined precisely the phase transition temperatures by measuring the specific heats and have obtained the concentration dependence of the phase transition temperature. Substitution of Co for Ni increases a little the transition temperature and contrary to this the substitution of Mn decreases the transition temperature rapidly.
The results are discussed on the basis of molecular field theory. In the case of $Ni_{1-x}Co_xCl_2{\cdot}2H_2O$, the concentration dependence of the phase transition temperature is well explained by molecular field theory. But, in the case of $Ni_{1-x}Mn_xCl_2{\cdot}2H_2O$ molecular field theory cannot explain sufficiently. Thus Mn spins in $NiCl_2{\cdot}2H_2O$ crystal show the peculiar behavior. We suppose that this may be attributed to a kind of the instability of Mn spins.