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3. Random-Field Effects in Three Dimensional Diluted Antiferromagnets

（３次元希釈反強磁性体におけるランダム磁場効果）

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Abstract

The effects of random fields on the three dimensional diluted antiferromagnets, $Mn_xZn_{1-x}F_2$ (x=0.45) and $Fe_xZn_{1-x}F_2$ (x=0.7, 0.4), have been studied by measurements of magnetization and specific heat. It is found that in both kinds of samples when the system is cooled in zero-field from the temperature above T_N and then the field is applied (ZFC), the susceptibility diverges in an extremely small external magnetic field, and as increasing the applied field, the peak of the susceptibility shows rounding around $T_N(H=0)$, which indicates the destruction of the phase transition. If the system is cooled in the applied field from the high temperature paramagnetic state (FC), remnant magnetization appears, and therefore the system evolves into a domain state. On the measurements of specific heat the results show that in $Mn_xZn_{1-x}F_2$ the λ-anomaly appears without the applied field, and that on applying the external field the peak shifts toward the lower temperature and rounds, while on $Fe_xZn_{1-x}F_2$ we have observed similar results to $Mn_xZn_{1-x}F_2$.

Also we have observed the relaxation of the remnant magnetization. The results show that in zero-field-cooled state the system is not in an equilibrium state at the temperature very close to $T_N(H=0)$ in the appropriate field, whereas there is no change on the magnetization in the field-cooled state. Therefore it is found that the micro-domain state is the more equilibrium state at least in the vicinity of $T_N(H=0)$ than the long-range ordered state.

Consequently those results support that the phase transition does not occur on a d=3 Ising system under the random field.