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Competing magnetic interactions and low-dimensional effects in EMR spectra of $(R_XY_{1-X})_2Cu_2O_5$ solid solutions

Janusz Typek

Copper spin dynamics in $(Dy_{0.375}Y_{0.625})_2Cu_2O_5$ and $(Er_{0.5}Y_{0.5})_2Cu_2O_5$ solid solutions has been investigated by electron magnetic resonance (EMR) technique. The temperature dependence of the EMR integrated intensity of the resonance line showed a pronounced maximum at low temperatures and vanished at the transition to the antiferromagnetic phase. The value of temperature at which the EMR integrated intensity reaches maximum is different for the processes of heating and cooling. Study of the product of integrated intensity and temperature allowed determination of the dominating interaction in a particular temperature range. A model used previously to describe the AFM modes in the antiferromagnetic state of $Y_2Cu_2O_5$ was applied to explain the observed changes in the EMR spectra. For $(Dy_{0.375}Y_{0.625})_2Cu_2O_5$ the values of appropriate exchange constants connected with a hierarchy of the exchange interactions have been calculated. A dimensional crossover from 2D to 3D magnetic behaviour was observed and interpreted in terms of the spin correlation length.