ion distribution over the magnetic sublattices. The difference in electronic shell structure of metal ions of these substances (ground states $^6S_{\frac{5}{2}}$ and $^4F_{\frac{3}{2}}$) seems to be important too. While the dependence of Fe_2O_3 may be accounted for by the magneto-dipole interaction [5], the corresponding calculations for Cr_2O_3 predict a value [2] which is by an order of magnitude less than the observed one.

It can be supposed that the effect observed may be accounted for by the anisotropic energy contribution connected with the spin-orbit interaction in the crystal. The present theory is unable to produce a quantitative estimate. However, one may expect that in a crystal with a large superexchange interaction ($T_N = 308^oK$) the properties of its anisotropic part [6] are significant in particular. They are noticeable against the small value of total anisotropy energy.

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EFFECT OF ELECTRON CORRELATIONS ON INTERACTION OF LOCALIZED MAGNETIC MOMENTS

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It is shown that the effect of electron correlations is to change the criterion for occurrence of localized magnetic states. The conditions of existence are different for parallel and antiparallel configurations of a pair of localized magnetic states. In general, the parallel configuration is favoured.

We consider the Anderson [1,2] model of two impurity transition metal atoms, each having a single, non-degenerate d-state, introduced into a matrix of a non-magnetic metal. The system of conduction and d-electrons is determined by the Hamiltonian (the notation of ref. 2 is used throughout).

$$\mathcal{H} = \sum_{k\sigma} \epsilon_k n_{k\sigma} + \sum_{i\sigma} E_0 n_{i\sigma} + \sum_{i\sigma} \tfrac{1}{2} U n_{i\sigma} n_{i,-\sigma} + \left(\sum_{ik\sigma} V_{ik} C^+_{i\sigma} C_{k\sigma} + \sum_{\sigma} V_{12} C^+_{1\sigma} C_{2\sigma} + \text{c.c.}\right). \quad (1)$$

$C_{k\sigma}$, $C^+_{k\sigma}$ refer to the conduction electrons, $C_{i\sigma}$, $C^+_{i\sigma}$ correspond to the localized d-electrons and $n_{k\sigma} = C^+_{k\sigma} C_{k\sigma}$, $n_{i\sigma} = C^+_{i\sigma} C_{i\sigma}$. ϵ_k is the energy of conduction electrons, E_0 denotes the energy of the localized d-state, U is the Coulomb interaction energy; V_{ik} and V_{12} are the matrix elements for the mixing interaction of electrons. We assume $U \gg |V_{ik}|$, $|V_{12}|$.

The expectation values $\langle n_{i\sigma}\rangle$ are calculated by the Green function method [4,3]. The chain of the equations of motion for the Green functions $\langle\langle C_{i\sigma}; C^+_{i\sigma}\rangle\rangle$ is reduced to a closed system by neglecting the Green functions $\langle\langle C^+_{k,-\sigma} C_{i\sigma} C_{i,-\sigma}; C^+_{i\sigma}\rangle\rangle$ and $\langle\langle C^+_{k,-\sigma} C_{i\sigma} C^+_{i,-\sigma}; C^+_{i\sigma}\rangle\rangle$ (cf. [3]), and by the following decouplings:

$$\langle\langle C_{k\sigma} n_{i,-\sigma}; C^+_{i\sigma}\rangle\rangle = \langle n_{i,-\sigma}\rangle \langle\langle C_{k\sigma}; C^+_{i\sigma}\rangle\rangle ,$$

$$\langle\langle C_{j\sigma} n_{i,-\sigma}; C^+_{i\sigma}\rangle\rangle = \langle n_{i,-\sigma}\rangle \langle\langle C_{j\sigma}; C^+_{i\sigma}\rangle\rangle \quad \text{for } j \neq i .$$

For $U \gg |V_{ik}|$, $|V_{12}|$ we find finally

$$\langle n_{i\sigma}\rangle = \frac{1 - \langle n_{i,-\sigma}\rangle}{\pi} \times \left[\arctan \frac{E_F - E_0 - (1 - \langle n_{i,-\sigma}\rangle)\left(\lambda - \dfrac{|V_{12}|^2}{U\langle n_{j,-\sigma}\rangle}\right)}{\Delta(1 - \langle n_{i,-\sigma}\rangle)} + \tfrac{1}{2}\pi\right]. \quad (2)$$