Lectures, Presentations etc

Lecture 3. "Some words about spin levels inversion in exchange coupled pairs under combined time reversal" by Prof. Ion I. Geru

The theoretical consideration of spin levels inversion in exchange coupled pairs has shown as follows:

1. Isomorphic substitution of one of the ions having the spin S ≥ 1/2 and the same electron configuration in the $3d$-$3d$ or $4f$-$4f$ binuclear cluster by a "time reversed" ion is accompanied by inverting the sign of the exchange interaction constant J.

2. The "time reversed" ion is obtained under T_1 or T_2 time reversal operator action on the state vector of electrons or holes in their electronic shell.

3. Isomorphic substitution of one of the ions of the $3d$-$3d$ or $4f$-$4f$ binuclear clusters of the same electron configuration by a "time reversed" ion leads to the time reversal symmetry violation (inverting the sign of the exchange interaction spin-Hamiltonian, H, under the action of T_1 or T_2 operators), which is restored due to inversion of the sign of constant J. Thus, from the chemical point of view, the referred isomorphic substitution is a method for controlled synthesis of binuclear coordination compounds by inverting the constant J sign during the synthesis process.

4. A classification of the coordination compounds containing $3d$-$3d$ or $4f$-$4f$ binuclear clusters by exchange interaction type between the paramagnetic ions of clusters has been made.

Lecture 4. "Condensons and bicondensons in low dimensional systems" by Dr. Natalia I. Kashirina
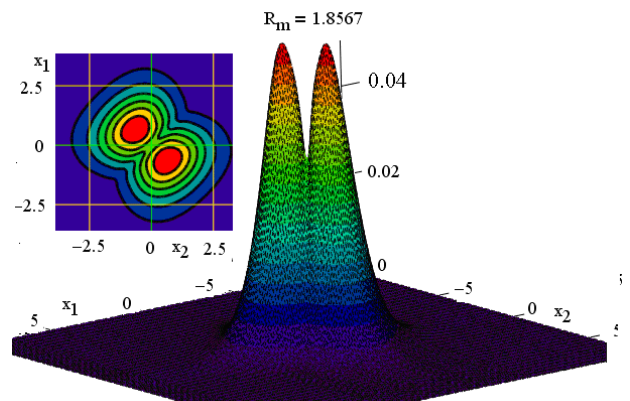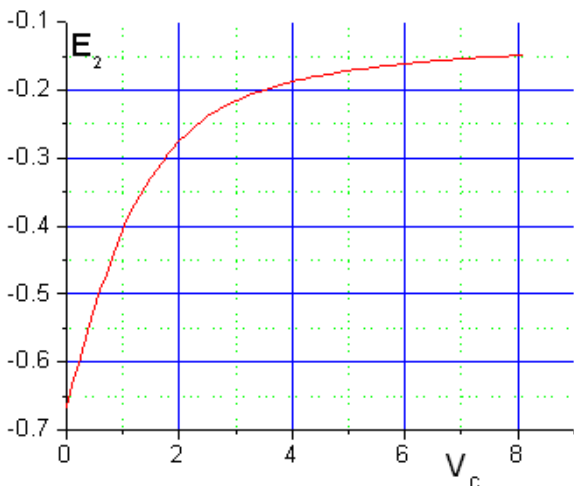
In this lecture, the basic definitions of condenson and bicondencon are presented.

The condenson functional in 3D system is as follows:

$$F[\Psi] = \frac{\hbar^2}{2\mu}\int|\nabla\Psi_1|^2 d\tau_1 - \frac{\sigma^2}{2\beta}\int|\Psi(r_1)|^2\delta(\mathbf{r}_1 - \mathbf{r}_2)|\Psi(r_2)|^2 d\tau_2.$$

$$F[\Psi] = \frac{\hbar^2}{2\mu}\int|\nabla\Psi_1|^2 d\tau_1 - \tilde{E}_b\int|\Psi(r_1)|^4 d\tau_2, \quad \tilde{E}_b = \frac{\sigma^2}{2\beta}$$

Each functional represented in the integral form has its respective representation in the form of corresponding differential equation. Here the matter concerns Schrodinger nonlinear equation.

$E_2 = -0.275406293$, $T_2 = 0.275402680$, $V_{2pot}/2 = -0.2754045$, $V_c = 2$

Fig. Dependence of the bicondenson energy on the parameter of electron-electron repulsion.

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