Nanoobjects microscopy

Relaxation time of intercalate electron subsystem

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Layer crystals thanks to the peculiarities of their structure could serve good material for forming inside them plate nanostructures. In the case of intercalation by 3d-elements sandwiches of mono atomic layers allow to avoid coagulation of 3d-element clusters (guests), protecting their matrix isolation. Presence of the magnetic active clusters in the van der Waals gap supports the Coulomb blockade of the electric current. Besides it creates the conditions of new unique magnetic properties, which serve the base for the new technologies of the medium materials. However crystal lattice should not be considered as completely insensible to such nanostructure. It will have a certain influence on average magnetic moment of the 3d-impurity.

Microscopic description of electron subsystem of layer crystal intercalated by 3d-impurities is based on the Anderson-like Hamiltonian [1]. Within the frame of electron mixing we considered not only structural changes caused by the appearance of intercalante but Coulomb interaction of electrons with opposite spines on the same 3d-atom taking into account strongly anisotropic dispersion of conduction band [1]. Transcendent equation for average number of occupation by electron with spin up and down in site i is obtained. It depends on microscopic energy parameters of crystal lattice and it is determined through integral equation. As the result effects of the magnetic momentum changes depending on the system parameters have been analyzed [2]. As the result we received density of electron states of intercalate. The effect of electron-electron interaction is studied by Green's function method.

Behavior of relaxation time depending on microscopic parameters of the system is discussed.

1. Lukiyanets B.A., Tovstyuk N.K. // Ukranian Phys. J. – 2001.- v.46, N1.- P.100-104.
2. Stakhira Y.M., et.al // Low Temperature Physics. - 2012. v.38, №1. - P. 69-75.