## “Nanocomposites and nanomaterials”

# The Induction of the Spin Transition in 2D Polymer {Fe(pz)[Pt$^{II}$(CN)$_4$]} by Means of Electrical Voltage

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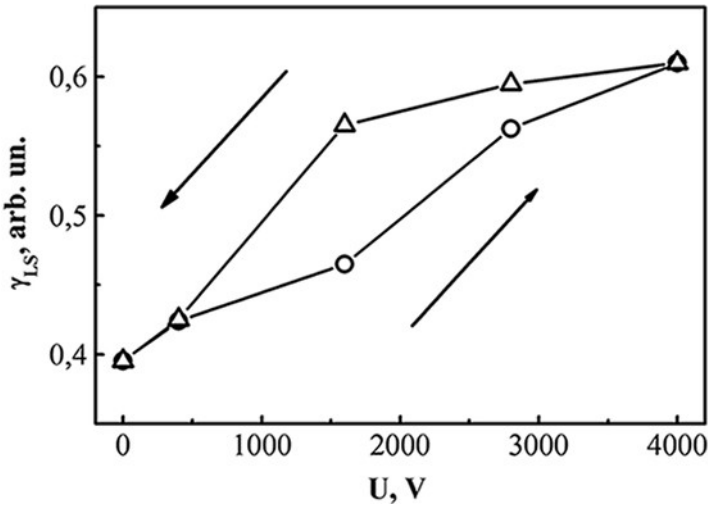
One of the directions of present nanomaterial physics is connected with study of the spin transition (ST) in low dimension metal-organic compounds. In this field is very important to study the ST behavior in the compounds with nanoscale size layers under temperature and external pressure variations, because it allows receiving the driving forces of the ST in perspective for application materials. For application goals it is important also to develop the alternative methods for ST induction.

The purpose of this paper is investigation of ST of $Fe^{2+}$ ions in coordination 2D polymer {Fe(pz)[Pt$^{II}$(CN)$_4$]} (pz – pyrazin), which is induced by electrical voltage. For that, the declared compounds were synthesized and the optic cell of special construction (OC) was designed and made. In this cell the working pressure is created by using of inverse piezoelectric effect in dielectrics. The deformation mechanical force of dielectric ceramics under the action of electric field is passed to the sample by means of multiplicator and moving plunger of the cell. As a result, pressure P effecting on the sample is determined by value of constant voltage U on piezoelectric element of OC.

The sample for measurements was prepared as thin transparent microcrystal layer putting between colorless polyethylene plates. It was fixed between OC pistons under initial pressure 0.054 GPa. Then electrical voltage U was applied to piezoceramic element and spectrograph PGS-2 registered transmission spectra of sample at room temperature. Spectral dependences of optical density were calculated from measuring transmission spectra with regard for dispersion of light in air.

As a result of analysis of optical density spectra in wavelength range from 340 to 750 nm it was obtained dependence of low-spin phase $\gamma_{LS}$ in coordination 2D polymer {Fe(pz)[Pt$^{II}$(CN)$_4$]} at increasing and decreasing of constant voltage U.




In presented figure is seen that at zero voltage and initial pressure 0.054 GPa about 40% complexes with ions $Fe^{2+}$ are in low-spin state. At voltage increasing from 0 to 4000 V pressure increases to 0.089 GPa and low-spin phase increases also on about 20%. Thus in experimentally obtained pressure range coordination 2D polymer {Fe(pz)[Pt$^{II}$(CN)$_4$]} demonstrates incomplete ST of $Fe^{2+}$ ions. At voltage decreasing hysteresis with width about $\Delta U \approx 1035$ V is observed.

In this investigation, for the first time, the possibility of inducing of the ST in SC compound by means of constant electric voltage is demonstrated. The ST of ions $Fe^{2+}$ in coordination 2D polymer {Fe(pz)[Pt$^{II}$(CN)$_4$]} investigated by absorption method in experimentally obtained pressure range from 0.054 to 0.089 GPa is incomplete and with hysteresis about $\Delta U \approx 1035$ V width. At the same time this experiment demonstrates that low dimension compounds are very perspective for new set of experiments – electrical voltage induction of spin transition. The observed behavior is discussed on the base of existing in this compound of nanoscale size layers.