CAPABILITIES OF NUCLEAR ELECTRON SPECTROSCOPY IN THE STUDY OF NON-STATIONARY PROCESSES IN CONDENSED MEDIA

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Nonstationarity of the processes is characterized by the time variability of their parameters. Implementation of precision nuclear-spectroscopic experiments requires high quality sources production and deep understanding of the processes ongoing in its material. It turned out that this is particularly important in the case of applying the sources in the form of rare earth oxides, where nonlinear dependence of their properties from ordering and disordering of structural formations is evident. Displaying the dielectric-ferroelectric phase transition is undoubtful. Based on the analysis of studies and other types of electron emission (Auger electrons and field-emission electrons) of the decay of radioactive isotopes of lutetium fraction in the oxide form on platinum substrate we can assume the formation of the atomic clusters source in the matrix, similar to toroidal quadrupoles of the structures.

The toroidal quadrupole can be represented as two closed solenoids with opposite toroidal moments, i.e. with an opposite current direction in the turns. The values of static quadrupole toroidal moments haven't been obtained yet. In our experiments it was estimated that the toroidal splitting M_4- and M_5-subshells of ytterbium into sublevels occurs in the superstrong magnetic field (B=10^4-10^5Tl). The thorough quantitative evaluation of the nature and the extent of the toroidal splitting would allow us to estimate the limits of weak interaction violating the temporal invariance.

The displaying of formations in the solid matrix of radioactive sources of atomic clusters in the nanometer range and in the nanostructures with closed magnetic flux, i.e. in the form of toroids was clearer observed in the decay of Lu→Yb and Lu→Hf.

The experimental data obtained by the methods of field-emission spectroscopy have shown that some of the toroidal clusters have the magnetic nature. At the same time, the experiment also points to the process of nuclear segnetization in nuclear oxides. This suggests the possibility of formation of electric dipole toroidal moments and conversion of the last into quadrupole ones.