Vladimir G Plekhanov, J Astrophys Aerospace Technol 2017, 5:4(Suppl)
DOI: 10.4172/2329-6542-C1-014

Direct observation of the strong nuclear interaction in the optical spectra of solids

Vladimir G Plekhanov
Fonoriton Sci. Lab., Estonia

Up to present time the macroscopical manifestation of the strong nuclear interaction are limited by radioactivity and the release of nuclear energy. Our communication is devoted to the description of the significantly new mechanism the strong force manifestation. Activation of the strong interaction by adding of one neutron to the nucleus causes the global reconstruction of the macroscopic characteristics of solids. We have studied the low - temperature optical spectra of the LiH and LiD insulator crystals (figure 1) which differ by term of one neutron from each other. As demonstrated early, most low energy electron excitation in LiH crystals are large radius excitons. In experiments we used the samples with clean surface cleaving in the bath of helium cryostat with normal or superfluid liquid helium. The samples with such surface allow to perform measurements for 15 hours. Exciton luminescence is observed when LiH crystals are excited in the fundamental absorption. The spectrum of exciton photoluminescence of LiH crystals cleaved in superfluid helium consists of narrow phononless emission line and its broader phonon replicas which arise due to radiative annihilation of excitons with the production of one to five LO phonons. As an example, the figure 2 shows the low - temperature (T=2K) photoluminescence spectra of LiH and LiD crystals. Comparison the experimental results on the luminescence spectra in the crystals which differ by one neutron only is allowed to the next conclusions. The addition of one neutron (using LiD crystals instead LiH ones) is involved in the increase of exciton energy on 103 meV. At the addition of one neutron the energy of LO phonons are decreased to 36 meV, that is direct seen also from luminescence spectra. As far as the gravitation, electromagnetic and weak interactions are the same of both crystals, it only changes the strong interaction therefore a logical conclusion is made that the renormalization of the energy of electromagnetic excitations (excitons, phonons) is carried out by the strong nuclear interaction. The last conclusion opens new avenue in the investigations of the strong nuclear interaction (QCD) using by means the condensed matter alike traditional nuclear methods (including accelerating technique).

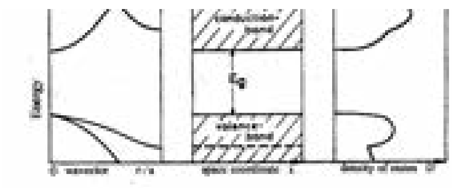

Figure 1.

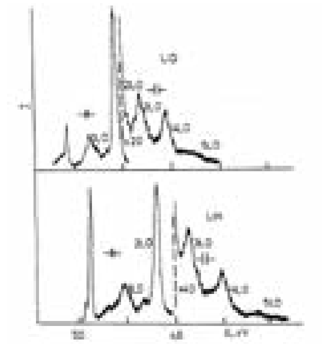

Figure 2.

Biography

Vladimir G Plekhanov has graduated from Tartu State University in 1968, PhD (Physics and Mathematics), Doctor of Science (Physics and Mathematics). His main interest fields include: the origin of the mass (quantization of matter) as well as the experimental manifestation of the strong nuclear interaction in the spectroscopy of solids. He is author of 197 publications both in English and Russian. His main books: *Isotope Effects in Solid State Physics* (Academic Press, San Diego, 2001); *Isotope - Based Quantum Information* (Springer, Heidelberg, 2012); *Isotope Effects: Physics and Applications* (Palmarium Academic Press, Saarbrucken, Deutschland, 2014) (in Russian); *Isotopes in Condensed Matter* (Springer, Heidelberg, 2013); *Isotope Effect - Macroscopical Manifestation of the Strong Interaction* (Lambert Academic Publishing, Deutschland, 2017) (in Russian).

vgplekhanov@gmail.com