V G Plekhanov, J Astrophys Aerospace Technol 2018, Volume 6
DOI: 10.4172/2329-6542-C6-032

4th International Conference on

High Energy & Particle Physics

December 03-04, 2018 | Valencia, Spain

Measurements of the power of strong nuclear interaction in solids

V G Plekhanov
Fonoriton Sci. Lab, Estonia

One of the fundamental goals of subatomic physics is to understand the structure and behavior of strongly interacting matter of its basic constituents, quarks and gluons. Quantum chromodynamics (QCD) is the theory of the strong interaction, responsible for binding quarks through the exchange of gluons to form hadrons (baryons and mesons). Up to now high energy electron (muon) scattering provides investigation into the structure of the proton and the neutron, together known as nucleons, as well as strong nuclear force. Recently it was shown the direct dependence of the energy of interband transition Eg in solids (for example LiHxD1-x crystals) on the strong nuclear interaction. The present report is devoted to advance description of the experimental results demonstrated indicated above dependence. In our experiments we have investigated the low-temperature optical spectra (reflection - Fig. 1 and luminescence) of LiHxD1-x crystals ($0 \leq x \leq 1$) which differ by term of one neutron from each other. The mirror reflection spectra of mixed and pure LiH and LiD crystals cleaved in liquid helium are presented in Figure 1. All spectra have been measured with the same apparatus under the same condition. As the deuterium concentration increases, the long-wave maximum (n=1S excitons) broadens and shifts towards the shorter wavelengths (analogous the shift of zero - phonon line in luminescence spectra). Figure 2 shows the concentration dependence of interband energy transition Eg. We can see that the value of Eg increases with increase of the power of strong interaction. Points derived from the reflection spectra are indicated by crosses, and those from luminescence spectra by triangles. The straight dashed line is the linear dependence of Eg in the virtual crystal model, and the solid line corresponds to calculation using polynomial of second degree. The obtainable experimental results are allowed to the next conclusions. Nonlinear dependence of electron excitations (excitons) on the power of strong nuclear interaction. We should take into consideration the strong interaction in quantum electrodynamics (QED) for description of the dynamics of electron excitations in solids.

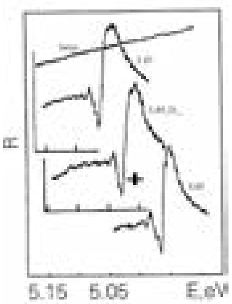

Figure 1

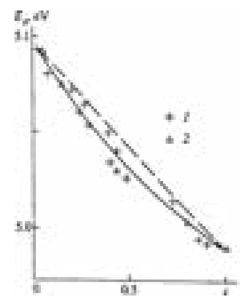
Figure 2

Recent Publications:

1. B Povh et al. (2006) Particles and Nuclei: An Introduction to the Physical Concepts. Springer. ISBN: 978-3-540-79367-0.
2. V G Plekhanov (2017) Astrophysics and particle physics. J. Astrophys. Aerospace Technol. 5(3):114.
3. V G Plekhanov (1997) Isotopic and disorder effects in large exciton spectroscopy. Phys-Uspekhi. 40(6):553.

Biography

V 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