On Thermal Stability of Fröhlich Polarons

1. Abstract Content should be in English
2. The maximum word count should be 250-300 words
3. If your title includes scientific notation, Greek letters, bold, italics, or other special characters/symbols, do make sure they appear correctly.
4. Corresponding details of corresponding author should be correct which will be used for further communication.
5. Abstracts should highlight the major points of your research and should not include tables, figures and references.

Format

Presentation title: On Thermal Stability of Fröhlich Polarons

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Presentation type: (Oral presentation / Poster presentation)

Abstract (250-300 words):

Polaronic (quantum dot) lifetime, $\tau_p$, is of fundamental importance for various applications in quantum optics [1]. In general, the $\tau_p$ quantity could be evaluated either via semi-classical or fully quantum approaches [1] (see also references therein). The latter one might be based essentially on so-called ‘Klemens channel’ formalism, implemented for the case of Fröhlich Polaron elsewhere in refs. [1 – 3]. This formalism, which is based, in particular, on idea of Longitudinal Optic (LO) phonon dissociation into two Longitudinal Acoustic (LA) phonons [1, 2], allowed one to evaluate the lifetime (relaxation time) of Fröhlich Polarons subjected to thermal fluctuations in crystalline lattices [1, 2] (see also sub-section 4.2 in ref. [3]). Herein, predictions of the ‘Klemens channel’ formalisms [1] are discussed in comparison to those of alternative model(s), which are (in particular) based on (semi-classical) ideas of thermally-activated inter-band transition of polaronic charge carrier and coupled to it lattice ‘depolarization’ mechanism. Key parameters of the latter phenomenon are evaluated quantitatively using the entirely quantum generalized ‘displaced harmonic oscillator’ framework [4], which is closely related in its spirit to so-called ‘Feynman polaron’ approximation [3], see also references therein.

Valeri Ligatchev's areas of scientific interest and expertise comprise of experimental and computational studies on electronic, optical, vibrational, relaxation time and defect states spectra as well as thermal properties of various (predominantly spatially non-homogeneous) semiconductors insulators and even superconductors, including nominally undoped and heavily doped polycrystalline and nano-crystalline diamond(s), flakes of two-dimensional semiconductors, silicon-germanium 'quantum dots', 'molecular wires', silicon micro- and nano-wires, hydrogenated amorphous silicon-based films, porous 'low-k' organic and inorganic insulating layers, as well as ceramic insulators with 'gigantic dielectric response' (GDR).

His so-called 'Generalized Skeetrup Model' becomes expedient in several areas: from realistic simulations on optical and electronic properties of polycrystalline and spatially non-homogeneous amorphous semiconductors and insulators as well as of their low-dimensional counterparts to convincing estimations on the harmonic and anharmonic fractions of lattice thermal capacity of such materials. He also substantiated condensed phases of Fröhlich polarons as the essence of the GDR phenomenon. Furthermore, he had implemented broadly advanced mathematical methods at deconvolution and interpretation of data of several well-established techniques of defect states spectroscopy.

Valeri Ligatchev is a member of The Electrochemical Society since 2007. His name had been included in 2011 Edition of Marquis Who’s Who in the World.