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### **Title of the lecture: Phonons near Peierls structural transition in the nanostructured tetrathiotetracene-iodide crystal**

#### **Abstract**

The behavior of the Peierls structural transition in quasi-one-dimensional organic crystals of tetrathiotetracene-iodide ( $\text{TTT}_2\text{I}_3$ ) for different values of carrier concentration is analyzed in 3D approximation. In the frame of the physical model, two the most important electron-phonon interactions are considered. The first interaction is of deformation potential type and the second one is of the polaron type. The scattering on structural defects is also taken into account, and it is shown that this interaction is very important for the explanation of the Peierls structural transition in  $\text{TTT}_2\text{I}_3$  crystals. The renormalized phonon spectrum is calculated in random phase approximation. It is shown that the transition is of Peierls type and strongly depends on iodine concentration. The Peierls critical temperature is determined. In [1] the same dependences for 2D physical model are presented. It is demonstrated that the hole-phonon interaction and the interaction with the structural defects diminish the renormalized phonon spectrum and reduce the sound velocity in a large temperature interval.

#### **References**

[1] Silvia Andronic, Anatolie Casian, Metal-insulator transition of Peierls type in quasi-one-dimensional crystals of  $\text{TTT}_2\text{I}_3$ . *Advances in Materials Physics and Chemistry*, 2017, vol. 7, nr. 5, p. 212-222. doi:10.4236/ampc.2017.75017

#### **Biography**

**Dr. Silvia Andronic** (1988) is a theoretical physicist. From 2010 she studies the metal-insulator transition of Peierls type and in 2018 completed a doctoral degree in this field. She worked in different scientific projects as follows: international project FP7 nr. 308768 FP7, national projects 11.817.05.13F and 14.02.116F, a project for young researchers 19.80012.02.01F. She is author of 40 publications and had presentations at different conferences and workshops.

**Prof. Anatolie Casian** (1935) is a theoretical physicist in the fields of semiconductors and of nanostructured materials. Area of interests: kinetic phenomena and thermoelectric properties of structures with quantum wells and of quasi-one-dimensional organic crystals. Academician of International Thermoelectric Academy (ITA). In 2017 he received the Golden Prize of ITA. Author of more than 300 publications. Coordinator of many national and international projects.