CHARGE-INDUCED STRUCTURE MODULATIONS OF 1D-IODINE INSIDE THIN SWCNTs

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In our work we present an experiments on charge induced change in the structure of one-dimensional iodine objects formed inside single-walled carbon nanotubes. We used electrochemical doping of the electrode made of filled nanotubes for controlled charging. For this purpose we designed simple supercapacitor-type electrochemical cells. Electrochemical charging of the filled nanotube leads to charging of one-dimensional iodine inside, as a result changing its geometry and properties. For instance, modulation with the trimer formation should be observed in one-dimensional atomic chains [1]. In our case we change the base unit that makes up the one-dimensional iodine. As the number of electrons in the filled nanotube increases, the base element, I_5^-, changes to I_3^-. Due to the fact that each anion has the unique Raman modes, Raman measurements allowed us to observe these modulations in-situ. Iodine in this experiment turned out to be a convenient object for research. This picture based on the characterization of individual molecular anions during modulation of the whole one-dimensional structure, provides a deeper insight into the structural and phase transitions of Peierls type.

For applications, these results are a step toward the production of nanoscale elements whose properties can be modulated, and the most important, these changes can be detected and predicted.

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References

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