SEMINARIUM RENTGENOWSKIE

Dnia 05.08.2014r. o godz. 10.30, w Sali D Instytutu Fizyki PAN, odbędzie się seminarium rtg. na którym **Dr. Jeremy Sloan** of the Department of Physics University of Warwick, United Kingdom, wygłosi referat na temat:

" High Resolution Transmission Electron Microscopy advanced imaging of low dimensional crystals "

Extreme nanowires formed by filling the central pore of single walled carbon nanotubes (SWCNTs) have extreme diameters and thus extreme properties. In some instances the extreme confinement causes entirely new crystalline forms not observed in bulk and these structures are investigated by high performance electron microscopy (i.e. hardware corrected HRTEM and exit wave reconstruction (EWR)). Until recently, there has been only limited research into the physical properties of these extreme nanowires. While there has been a significant effort in terms of revealing the physical properties of, for example, KI and HgTe extreme nanowires in SWCNTs by density functional theory (DFT),[1,2] there are few experimental studies besides imaging. A significant impetus towards new studies in these materials has been given by the observation that under beam irradiation or induced strain, some materials undergo significant 'phase change' behaviour.[3-5] We report here investigations into two new systems, SWCNT embedded SnSe[5] which undergoes band gap expansion, as well as shear induced phase change behaviour in SWCNTs with diameters >1.4 nm and also experimental studies into two-atom thick SWCNT-embedded HgTe extreme nanowires. Raman spectra have been measured for ensembles of bundled filled tubes for excitation photon energies in the ranges 3.39 to 2.61eV and 1.82 to 1.26eV for Raman shifts down to ~25 cm^{-1} and sample temperatures in the range 4-300K. All of the evidence support the hypothesis that the observed Raman features are not attributable to single walled carbon nanotubes, but instead to the HgTe nanowires. The observed additional features are due to four distinct phonons, with energies 47, 51, 94 and 115 cm^{-1} respectively, plus their overtones and combinations.[6]

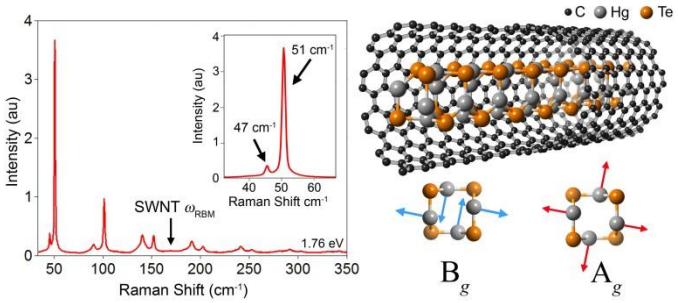

Figure 1: Raman spectrum of HgTe extreme nanowire shown in insert along with DFT determined vibrational mode displacements for two main Raman modes attributable to a P42/m rod group.

1. E. L. Sceats, J. Green and S. Reich, Phys. Rev. B 73 (2006), 125441/1-11.
2. R. Carter, J. Sloan, A. Vlandas, M. L. H. Green, A. I. Kirkland, R. R. Meyer, J. L. Hutchison, P. J. D. Lindan, G. Lin, J. Harding, Phys. Rev. Lett., 96 (2006) 215501/1-4.
3. C. E. Giusca, V. Stolojan, J. Sloan, F. Börrnert, H. Shiozawa, K. Sader, M. H. Rümmeli, B. Büchner, S. R. P. Silva, Nano Lett., 13 (2013) 4020–4027.
4. J. Sloan, A. I. Kirkland, J. L. Hutchison and M. L. H. Green, Compt. Rend. Phys., 4 (2003) 1063-1074.
5. R. Carter, M. Suyetin, S. Lister, M. A. Dyson, H. Trewhitt, S. Goel, Z. Liu, K. Suenaga, C. Giusca, R. J. Kashtiban, J. L. Hutchison, J. C. Dore, G. R. Bell, E. Bichoutskaia, J. Sloan, Dalton Trans., 43 (2014) 7391-7399.
6. J. Spencer, J. M. Nesbitt, H. Trewhitt, R. J. Kashtiban, G. R. Bell, V. G. Ivanov, E. Faulques, J. Sloan, D. C. Smith, ACS Nano, 2014 (submitted).

dr hab. Sławomir Kret