Raman studies of epitaxial multi-graphene films grown on a 6H-SiC substrates.

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Raman spectroscopy has historically been used to probe structural and electronic characteristics of graphite materials, providing useful information on the defects (D-band), in-plane vibration of sp^2 carbon atoms (G-band), as well as the stacking orders (2D-band) [1]. This method fit also for quality examination of new carbon material – graphene. Raman spectra of graphite (graphene) may contain three strongest lines. Line *G* at ~1582 cm^{-1} derives from the doubly degenerate phonon mode of E_{2g} symmetry from the Brillouin zone center. Line *D* at ~1352 cm^{-1} appears in samples with high concentrations of structural defects and is associated with phonons close to the *K* point of Brillouin zone boundary. Line 2*D* (~2710 cm^{-1}) originates from resonant light scattering involving two phonons of equal energy but with oppositely directed wave vectors, and provides information on the stacking order of graphite (graphene) layers.

The micro-Raman studies were performed in back-scattering geometry $y(xx)\bar{y}$ on a Horiba Jobin-Yvon T64000 spectrometer by means of a confocal microscope at room temperature. The spectra were excited with an Ar+ laser (λ = 514.5 nm). To exclude local heating effects, which could result in a shift of phonon lines, the laser radiation power on the sample was <1 mW (diameter of the laser beam was 4 μm).

For investigations multi-graphene layers on 6H-SiC substrates were used. Graphene films were grown on silicone carbide by sublimation method [2]. We used samples grown in the temperature range of 1300-1600°C to examine the quality of multi-graphene films from growth temperature.

Raman spectra of samples grown at low temperatures (1300-1400°C) exhibit strong line D, which indicate the presence of defects, whereas spectra of samples grown at high temperatures (1500-1600°C) don't exhibit D-line.

Thus Raman investigations show that the multi-graphene films grown at low temperatures are much more defective than the films grown at high temperatures.

[1] M.A. Pimenta, G. Dresselhaus, M.S. Dresselhaus; L.G. Cancado, A. Jorio, R. Saito, *Phys. Chem. Chem. Phys.* **9**, 1276 (2007).

[2] A.A. Lebedev, I.S. Kotousova, A.V. Lavrentiev, S.P. Lebedev, I.V. Makarenko, V.N. Petrov, A.N. Titkov, *Phys. Solid State* **51**(4) (2010).