Graphene Enhanced Raman Scattering From Deoxyribonucleic Acid Constituents

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Graphene enhanced Raman scattering is comparatively new spectroscopic branch of science, which is connected on the one hand with graphene applications in optical biosensing and on another hand with fundamental understanding of Surface Enhanced Raman Scattering mechanisms [1]. These mechanisms traditionally include electromagnetic and chemical enhancements. First one is connected with strongly localized near the surface light induced electric fields. They can appear as a result of resonant interaction of incident light with electron plasma oscillating near the surface of thin metal or semiconductor films and nanoparticles. Such interaction in case of graphene occurs in the THz spectral range. So we do not consider this effect, because our samples were excited by visible laser light 488 nm and 514 nm. Nevertheless for such constituents of deoxyribonucleic acid as adenine and constituents of protein as glycine, we obtained 2-10 times enhancement of Raman signal. We associate this enhancement with charge transfer effects appearing in case of close contact between the tested molecules and graphene surface. As a result of this charge transfer change of molecule polarizability can occur and result in enhanced Raman response. The features of this so-called chemical mechanism of Raman enhancement are discussed in our work relatively to the constituents of deoxyribonucleic acid.

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