Fritz-Haber-Institut der Max-Planck-Gesellschaft

Physikalische Chemie — Direktor: Prof. Dr. Martin Wolf

MAX-PLANCK-GESELLSCHAFT

Department Seminar:

Monday, September 9, 2019, at **11:00** a.m.;
— all are invited to meet at around 10:40 for a chat with coffee & cookies —

Sören Wasserroth Physics of Nanostructures group,
Institute of Experimental Physics,
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Surface-Enhanced Raman Scattering of Carbon Nanosystems

PC Seminar Room G2.06, Building G, Faradayweg 4 M. Wolf

Abstract:

Surface-enhanced Raman scattering (SERS) is a widely used technique in analytics, biosensing, and many more. SERS overcomes the disadvantage of the low scattering cross section of traditional Raman scattering by using plasmonic near fields to enhance the scattering process even achieving single molecule detection. First, I will discuss how graphene was used to determine the near field resonance of a gold nanodimer [1]. Exfoliated graphene was suspended over the dimer. An extensive Raman characterization showed the strong localization of the plasmonic near field and the influence of the plasmonic near field to the polarization dependence of the graphene Raman modes. Wavelength dependent Raman measurements of the G and 2D mode were performed to determine the plasmonic resonance using the higher-order Raman scattering theory. Graphene is an excellent Raman reporter to be a standard to compare the enhancement factor of different SERS substrates due to its constant Raman cross section. In the second part I will extend the discussion to molecules with an intrinsic resonance [2]. I will present measurements of α-6T molecules encapsulated in CNTs. By dielectrophoretic deposition of the CNTs it is possible to precisely control the position and orientation of the molecules in the plasmonic hotspot which is crucial to understand the interaction between the intrinsic resonance and the external plasmonic near field. We were able to disentangle the intrinsic resonance and the influence of the plasmon by measuring a reference nanotube without plasmonic enhancement..

[1] S. Wasserroth et al., Graphene as a local probe to investigate near-field properties of plasmonic nanostructures, *Phys. Rev. B* **97** (2018).
[2] S. Wasserroth et al., Resonant, Plasmonic Raman Enhancement of α-6T Molecules Encapsulated in Carbon Nanotubes, *J. Phys. Chem. C* **123** (2019).