High field nanoplasmonics (On the way to nuclear fusion)

Norbert Kroo

Wigner Physics Research Center, Institute of Solid State Physics and Optics, Galgoczy str 51/B, Budapest 1125, Hungary

Surface plasmon polaritons are the light of the nanoworld, with a broad spectrum of special properties. These properties open the field for a high number of applications, both in the fields of low and high intensities. The present lecture summarizes the plasmonic properties of localized (LSPP) plasmons. They play asignificant role in many high field applications. Here a special appllication of localized surface plasmons is presented. These plasmons are resonantely excited by ultrashort (n.10 fs) , high intensity (up to n.10^{17} W/cm^2) pulses of a Ti:Sa laser on resonant gold nanoparticles, implanted into a transparent polymer, creating craters in the studied samples. The volume of these craters, produced by the laser pulses in clean and gold nanoparticles implanted polymers has been studied as the function of the exciting laser intensity. Simultaneously the C-H and C-D oscillation Raman scattering lines were also measured on the crater surfaces. Preliminary data indicate fusion energy production due to the nuclear trasmutation (hydrogen to deuterium) in the nanoparticle seeded sample, already at these "relatively low" laser intensities, clearly proving the decisive role of different properties (screening and accelerating protons) of the LSPP-s in both observed phenomena. The roughness, attributed to the nuclear processes on the crater surface is also analyzed. Preliminary data of other techniques (optial and mass spectrometry and some nuclear methods) are also shown. Some results on modelling are also presented.

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