High Field Nanoplasmonics (On the Way to Nuclear Fusion)

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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.

In the present work, localized plasmons (LSPP) have been resonantly excited by ultrashort (n×10 fs), high-intensity (up to n×10^{18} W/cm^2) pulses of Ti:Sa lasers on gold nanoparticles, implanted into a transparent polymer. The laser shots created craters in the studied samples. The volume of these craters is presented as a function of the exciting laser intensity for the samples with (significantly larger) and without resonant gold nanoparticles.

The difference is explained by the creation of deuterium in the nanoparticle-seeded sample, detected with Raman and LIBS spectroscopy. These data indicate significant energy production by nuclear transmutation (hydrogen to deuterium), clearly proving the decisive role of the unique properties of the LSPPs.

BN-seeded samples have also been studied, where the $p^{11}B$ reaction has been observed by Thompson parabola measurements and by detecting α particles in CN39 films. Some results of mass spectrometry measurements are also presented, confirming some results of the observations mentioned above. Some results of time-of-flight electron spectra are also shown at medium (up to 10^{12} W/cm^2) intensities, indicating superconductivity at room temperature.