

# Optical rectification effect in nano-carbon CVD films

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We report on the first observation of the optical rectification effect in the nano-carbon (nC) films. The effective second-order susceptibility of the film is found to be  $2 \times 10^{-5}$  CGSE, which is two orders higher than that of the conventional non-linear crystals.

The nC films were obtained by CVD method and consist of nano-sized graphite crystallites preferably oriented along the substrate normal [1]. In the non-linear optical experiment, we measure the potential difference between two electrodes attached to the nC film surface [2]. This electric signal is generated when the film is irradiated by a nanosecond laser pulse. The temporal profile of measured electric signal well reproduces the envelope of incident light pulse. We found that the observed in the experiment dependence of the light-induced voltage on intensity, polarization, wavelength and angle of incidence are well described in terms of the optical rectification in non-linear optical media [2].

The experimental results indicate that the effect may originate from the quadrupole and magnetic dipole mechanism of optical nonlinearity. In the nC films this mechanism may be pronounced because of the strong delocalization of sp<sup>2</sup> orbitals within the graphitic layers.

The observed nonlinear optical effect indicates that nC films is a prospective material to be employed in fast wide band optical detectors and position sensitive devices.

[1] A.N. Obraztsov, A.A. Zolotukhin, et al., DRM 12(2003)917.

[2] G.M. Mikheev, R.G. Zonov, A.N. Obraztsov, Yu.P. Svirko, Appl. Phys. Lett. 84(2004)4854.