Laser-produced plasma of carbon nanotubes

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Interaction of laser radiation with nano- and microstructured materials is intensively developing direction of investigations. Such studies are conducted to find optimum parameters and configurations of targets for inertial cornfinement fusion [1], as well as the development of radiation sources with specified characteristics in different spectral ranges, such as X-ray [2]. Carbon nanotubes as a promising type of nanostructured materials are of interest for laser-matter interaction.

Experimental studies of X-ray characteristics of the laser-produced plasma of carbon nanotubes are presented. Multi-walled carbon nanotubes (diameter ~ 30nm) were fabricated by catalytic pyrolysis of benzene using ferrocene as a precatalyst [3]. Nanotubes deposited onto the quartz substrate have been used as the targets. The experiments have been carried out using the powerful laser installation “Kanal-2” [4]. The target has been irradiated by nanosecond IR laser pulse (λ = 1,06 μm) with controllable function of mutual coherence. The power flux density of the laser radiation on a target was ~10^{13} W/cm^2.

The spatial, temporal and energy characteristics of X-ray plasma radiation have been investigated by means of pinhole-camera, Schwarzschild objective, and time resolution detector. Radiation of plasma was registered in soft X-ray (180-200Å) and hard X-ray ($\lambda \leq$ 9 Å).

The work is partly supported by the Russian Foundation for Basic Researches, grant # 10-02-00113.

[1] Borisenko N.G., Merkul’ev Yu.A., and Gromov A.I. *Journal of the Moscow Physical Society* **4**,247 (1994).
[2] Bagchi S., Kiran P., Yang K., Rao A.M., Bhuyan M.K., Krishnamurthy M., Kumar G.R. *Phys. Plasmas* **18**, 014502 (2011).
[3] X. Devaux, S.Yu. Tsareva, A.N. Kovalenko, E.V. Zharikov, E. McRae. *Carbon* **47**, 1244 (2009).
[4] S.I. Fedotov, L.P. Feoktistov, M.V. Osipov, A.N Starodub. *Journal of Russian Laser Research* **25**, 1 (2004).