PROCEEDINGS OF THE INTERNATIONAL CONFERENCE
NANOMATERIALS: APPLICATIONS AND PROPERTIES
Vol. **2** No 3, 03AET07(2pp) (2013)

Set-up for Nanosized Powder Synthesis and Set-up for Deposition of Composite and Multilayer Films

G.N. Churilov[1,2,3,*], A.L. Kolonenko[2], A.I. Dudnik[1], T.A. Leonova[3], I.V. Osipova[1], N.G. Vnukova[1,2], G.A. Glushenko[1,2]

[1] *Kirensky Institute of Physics, 50, Akademgorodok, Krasnoyarsk, 660036 Russia*
[2] *Krasnoyarsk State Pedagogical University, 89, Lebedevoy, Krasnoyarsk, 660049, Russia*
[3] *Siberian Federal University, Krasnoyarsk, 79, Svobodny, 660074, Russia*

(Received 07 June 2013; published online 01 September 2013)

Set-up for nanosized powder synthesis and set-up for deposition of composite and multilayer films were described.

Keywords: Fullerenes, Nanowires and Nanoparticles, Composite and Multilayer Films.

PACS numbers: 52.77.–j, 07.30.Kf

The set-up for synthesis of nanosized powder, fullerenes, nanowires and nanoparticles with structure core- shell was operated by us [1]. It is possible to control the synthesis processes by changing the value and frequency of arc current and pressure in the chamber. The capability of direction of the different fullerene content and nanoparticles and nanowires structures was structurally and principally in the set-up for nanosized powder synthesis.

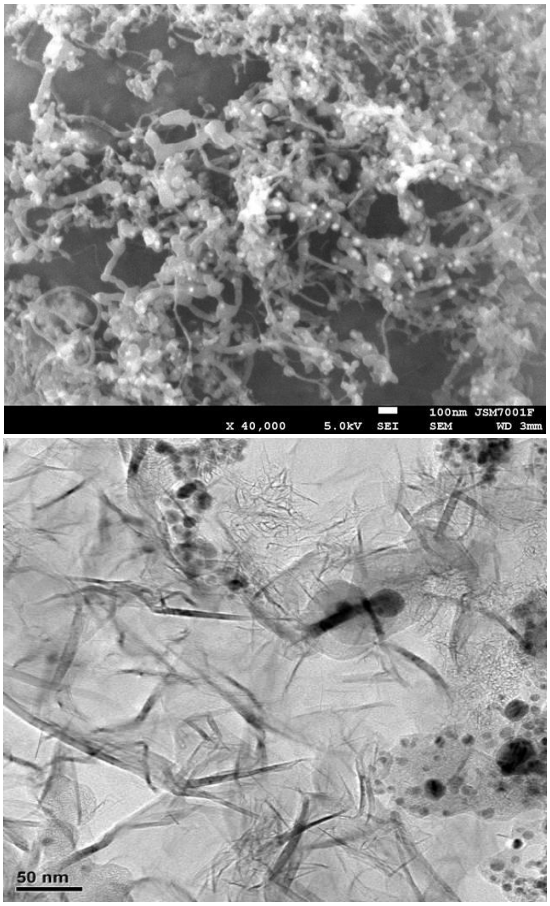

Fig. 1 - SEM image of carbon condensate produced at 0,1 MPa (a) and 0,4 MPa (b)

The main technical characteristics of set-up:

Productivity: 60 g/h fullerene contained condensate, 6 g/h-fullerene; Set-up power: 16 kW; Helium expense: 1-4 l/min;

The synthesis was carried out with Ni inputting in the high- frequency arc plasma under helium pressure from 0,1 to 0,4 MPa. he Ni nanopartices with carbon coating and carbon fiberes were produced at 0,1 MPa helium pressure (Fig. 1a) and the Ni nanoparticles and graphene – at 0,4 MPa helium pressure (firg.1b).

The quantity of amorphous carbon increased with increasing pressure. Carbon soot produced at increasing pressure contains less quantity of extractable fullerenes.

At Si inputting during synthesis the particles SiC coated by carbon with sp^2 and some addition of sp^3 hybridization and nanowires SiC were synthesized. The purification of carbon condensate was carried out by acid boiling and annealing in air flow. The diameter of nanowires SiC was 20-60 nm and the length – several microns (Fig. 2).

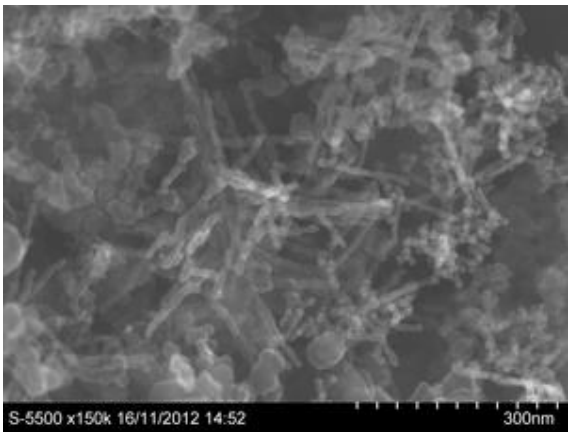

Fig. 2 - SEM image of carbon condensate with SiC nanowires

By structure investigation it was shown that nanowires are monocrystals with hexagonal structure 6H, which transfer to cubical ones with crystallite sizes increasing until some microns under annealing the sam-

* churilov@iph.krasn.ru

ples. The powders with low resistance (10-10^{-1} Om·mm) were received by synthesis with inputting N_2 or B.

The set-up for deposition of composite and multilayer films was operated on the base of vacuum apparatus (VUP-5) with inductive sensitive heat of crucibles from 0 till 2000 °C.

By contemporary evaporation of fullerene, B and Ta, the films with photo electromotive force, which has maximum of photosensitive on the 480 nm, will be synthesized (Fig. 3) [2].

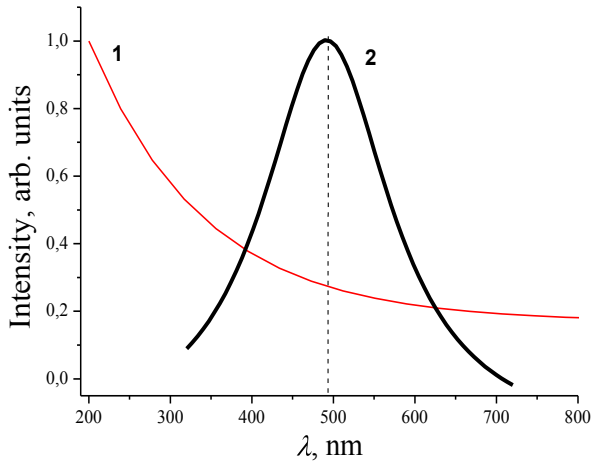

Fig. 3 - The dependence of absorption coefficient (1) and photoconductivity (2) from the wavelength

Those films can be used as photosensitive elements at the visible range of radiation. The sensitivity maximum of films is displaced in the short-wave region only

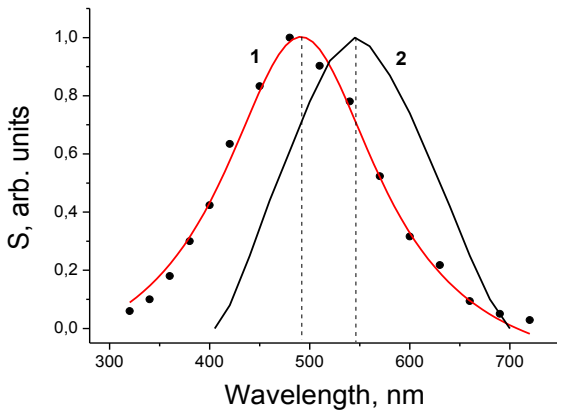

Fig. 4 - The dependence of photosensitive from the wavelength: 1- film; 2- human eye [3].

on 60 nm according to sensitivity maximum of human eye (Fig. 4).

The work was partially supported by the Ministry of Education and Science of Russian Federation, agreement № 8194 and 14.B37.21.0163, Russian Foundation for Basic Research project № 12-03-31439, and Russian Academy of Science (Integration project of Belarus NAS and SB RAS №24).

REFERENCES

1. G.N. Churilov, *Fullerenes, Nanotubes and Carbon Nanostructures* **16**, 395 (2008).
2. A.I. Dudnik, A.O. Il'ina, V.A. Serjodkin, G.A. Glushhenko, *Mat. Sci.* **4**, 19 (2010).
3. *Fundamentals of Semiconductors* (Ed. Yu. Peter, M. Cardona) (Moscow: Physmatlit: 2002).