



## Obtaining of Carbon Nanowalls by PECVD Method in the Plasma of Radio-Frequency Discharge

Batyshev D. G.<sup>1,2</sup>, Yerlanuly Ye.<sup>1,2,\*</sup>, Ramazanov T. S.<sup>3</sup>,  
Dosbolayev M. K.<sup>2</sup>, Gabdullin M. T.<sup>2</sup>

<sup>1</sup>Laboratory of engineering profile, al-FarabiKazNU, Kazakhstan,050040 Almaty, 71 al-Farabiave,  
<sup>2</sup>National nanotechnological laboratory of opened type, al-FarabiKazNU, Kazakhstan,050040 Almaty,  
71 al-Farabiave.

<sup>3</sup>Institute of experimental and theoretical physics, al-FarabiKazNU, Kazakhstan,050040 Almaty, 71 al-Farabiave.  
E-mail: yerlanuly@physics.kz

Carbon nanowalls (CNWs) are one of the allotropic modifications of carbon with vertical orientated graphite-like structure<sup>1,2</sup>. The CNWs have unique properties, such as high mechanical strength and electrical conductivity<sup>3-5</sup>, due to their large specific surface area and density. According to this the CNWs are used as electrodes in capacitors<sup>6</sup> instead of porous carbon. In this work, a method of obtaining of CNWs by plasma enhanced chemical vapor deposition (PECVD) in radio-frequency (RF) discharge is considered.

The CNWs were synthesized on the surface of silicon substrate with thin catalytic nickel nanolayer by PECVD method. The experiments were carried out in flow of argon and methane gases at temperature of 500°C, pressure of 2 Tor and RF power of 10-15 W with initial annealing in argon plasma. The results of experiments are shown in figure 1, where a SEM image and Raman spectrum of typical CNWs structure are presented.

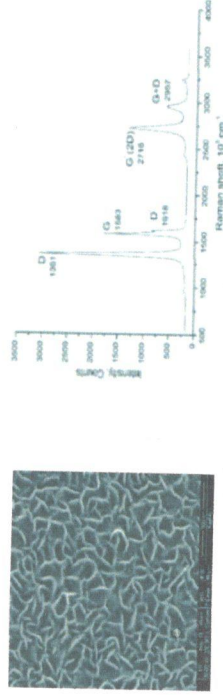


Fig. 1. SEM image (left) and Raman spectrum (right) of CNWs

## References

- [1] Wu, Y. H.; Qiao, P. W.; Chong, T. C.; Shen, Z. X. *Adv. Mater.* 2002, 14, 64
- [2] Kurita S., Yoshimura A., Kawamoto H., Uchida T., Kojima K., Tachibana M., Molina-Morales P., Nakai H. *J. App.Phys.* 2005, 97, 104320
- [3] Stankovich S., Dikin D. A., Dommett G.H.H., Kohlhaas K. M., Zimney E.J., Stach E. A., Piner R. D., Nguyen S. T., Ruoff R. S., *Nature* 2006, 286, 282.
- [4] Hiramatsu M., Hori M., *Carbon Nanowalls* (Springer, New York, 2010).
- [5] Yoon D., Moon H., Cheong H., Choi J., Choi J., Park B., *J. Korean Phys. Soc.* 2009, 55, 1299.
- [6] Kim S. Y., Shin S.K., Kim H., Jung Y.-H., Kang H., Choi W.S, Kweon G.B., *Trans. Electrical and electronic materials* 2015, 16, 4, 198-200.

