CVD facility for formation of carbon nanomaterials on a space station board

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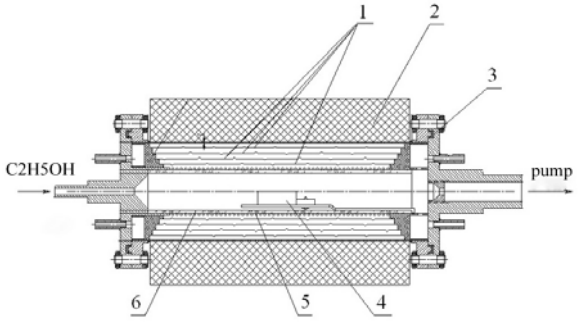
A facility for formation of carbon nanotubes, diamond-like coatings and other carbon nanostructures by chemical vapor deposition [1] carrying out on a space station board is presented.

Unique solutions for thermal protection, optimal weight and size without explosive gases and dangerous materials offer an opportunity to use the facility for the formation of carbon nanostructures under complex conditions: large temperature and pressure drops, microgravity and cosmic radiation. This facility consist of a quartz chamber for the CVD-process, a bulb with evaporating liquid and a substrates holder fixed inside the chamber (see Fig.). Varying gas environment, temperature and pressure inside the chamber and using various types of substrates leads to formation various types of nanomaterials.

To analyse of materials were used auger-spectroscopy, scanning and transmission electron microscopy and x-ray microanalysis.

In particular, at the temperature ~ 800ºC and pressure less than 10 Torr on steel substrates carbon nanotubes coating within the range 10-100 nm in diameter and up to 100 microns in length is formed. It's necessary to mention that increasing time of process results in increasing maximum length of nanotubes. At the temperature 950-1000ºC and pressures over 20 Torr continuous diamond-like coating with crystal dimensions from several nanometers to 10 microns is formed.

There are prerequisites that nanostructures would be defectless and growing processes more productive due to microgravity and high vacuum on the space station board.



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[1] X. Wang, Q. Li, J. Xie, Z. Jin, J. Wang, Y. Li, K. Jiang, S. Fan, *Nano Letters* **9**, 3137 (2009).