

Natural carbon micro- and nanostructures: products of natural nanoengineering

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Modern knowledge of nanoscience includes a lot of carbon nanostructures synthesis methods. Nevertheless (a) magmatic silicate medium and (b) long duration (more than 2 days) are unusual in any technology. These parameters as well as low temperature (500-700°C) and carbon precursor are common in geological environment. Only small number of natural carbon nanostructures are known [1,2,3] and some of them [2] are listed at fig.1. Well-known "man-made" MWCNT [4 and others] and natural multilayer carbon micro- and nanotubes are very similar in morphology and in diameter dimension. The main feature of the natural carbon nanostructure architecture is formation of micro-nanotubes and carbon cones within amoeba-like graphite granules.

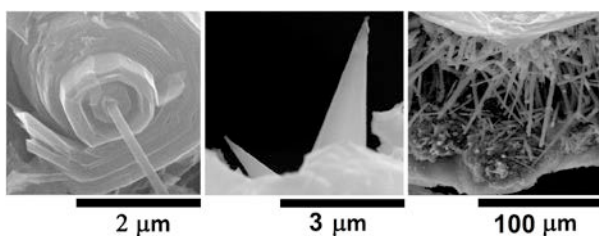


Fig.1: Left - MWCNT; in the center – cone; on right - amoeba-like graphite granule. In the section of granule from top to bottom are the several layers of graphene – porous carbon – cones and MWCNT - porous carbon - several layers of graphene.

[1] Jaszczak *et al.* (2007) *Canad. Miner.* **45**, 379-389. [2] Ponomarchuk *et al.* (2013) *Bul. of the Russ. Acad. Sci. Phys.* **77**, 203–206. [3] Ryabov *et al.* 2012 *Doklady Earth Science* **446**, 1193–1196. [4] *Carbon Nanotubes*: Ed. Endo&Iijima& Dresselhaus (1997).