A43 - Carbon nanotubes growth in 3D substrates

Erica F. Antunes [1], Anderson O. Lobo [2], Evaldo J. Corat [3], Vladimir J. Trava-Airoldi [4], Marcos Massi [5]

[1] Instituto Tecnológico de Aeronáutica (ITA)/ Instituto Nacional de Pesquisas Espaciais (INPE), [2] Instituto Tecnológico de Aeronáutica (ITA), Instituto Nacional de Pesquisas Espaciais(INPE), [3] Instituto Nacional de Pesquisas Espaciais (INPE) [4] Instituto Nacional de Pesquisas Espaciais, [5] Instituto Tecnológico de Aeronáutica

Electrochemical deposition had been used to prepare Ni, Fe and Co nanoparticles with different nucleation and different particle diameters for multi-walled carbon nanotubes (MWCNT) growth. The main advantage of electrodeposition related to other methods more commonly used for catalyst deposition, such as dip-coating, spin coating or e-beam evaporator is the 3D character, which allows the MWCNT growth on the whole surface, such as in glassy carbon or carbon felt structures.
In this work we report the preparation of Ni catalyst films for growth of multiwalled carbon nanotubes. We have used an electrolytic solution of 0.01M $NiSO_4.6H_2O$ and 0.01M H_3BO_3 in water. The electrochemical deposition was carried out on a two-electrode cell with a DC power supply. Carbon felt and glassy carbon were used as substrates for MWCNT growth. The Ni electrodeposition system was mounted with the substrate as working electrode and platinum as counter electrode. A distance of 1cm and a current density of $2mA/cm^2$ were established as standard.
The samples were washed by distilled water, dried at room temperature (22°C), and then loaded into a microwave plasma chamber for MWCNTs deposition. The process consists in two steps: 1) nanoclusters formation, which was carried out during 5 min in N_2/H_2 plasma, at a substrate temperature around 760°C; and 2) MWCNT formation, which was performed by adding CH_4 carbon source to the gas mixture during 2 min, at a substrate temperature of 780°C. The reactor was kept at a pressure of 30 Torr during the whole process and the microwave power was 800 W. The results showed very good efficiency and homogeneity of MWCNT nucleation on the Ni nanoparticles, as verified by high resolution electron microscopy.

Contact e-mail: *ericafa@las.inpe.br*

A44 - Role of catalyst particles during CNT growth

Albert G. Nasibulin [1], Sergey D. Shandakov [1], Anton S. Anisimov [1], David P. Brown [1], Hua Jiang [2], Peter V. Pikhitsa [3], Esko I. Kauppinen [1]

[1] Helsinki Univeristy of Technology, [2] VTT, [3] Seoul National University

Mechanism of the single-walled carbon nanotube (CNT) formation is studied in the aerosol (catalyst floating) synthesis method. On the basis of *in situ* sampling experiments the role of catalyst particles is investigated. An essential role of CO_2 and H_2O vapor in the formation of single-walled CNTs is proposed. The detailed mechanism of graphene sheet transformation during the CNT growth is discussed.

Contact e-mail: *albert.nasibulin@hut.fi*