128 Interaction of light ions with multi-walled carbon nanotubes

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Carbon nanotubes (CNTs) are systems of unquestionable technological interest. Due to their low dimensionality, nanometer size and remarkable electronic, mechanic and magnetic properties, nanotubes are promising structures for many purposes in several fields of physics, materials science or biomedicine [1].

The bombardment of carbon nanotubes with energetic particles is a well-established method to modify their structure and their physical properties. Also, ion beams can be used as analytical tool to characterize the structure and morphology of nanotubes, such as the number of walls, which is one of the parameter that strongly affect their chemical and physical properties [2].

We have studied experimentally the energy loss of protons and molecular fragments from H_2^+ in multi-walled carbon nanotubes (MWCNTs) dispersed on top of a Quantifoil TEM grid coated with a polycrystalline Au thin film (30 nm).

The experiments were done in transmission geometry, in a way that the ion beam impinges perpendicularly to the main nanotube axis. Experimental setup have been described in detail in previous works[3, 4] . Beam energy is in the range between 2 and 10 keV, where the electronic stopping regime dominates.

Fig. 1 shows the energy loss of ions after passing through MWCNTs as a function of the mean energy. Data of molecular fragments and protons are coincident within the experimental uncertainties, showing the absence of an isotopic effect on the stopping power of CNTs in this range. Inset shows the energy spectrum of 5 keV protons after interacting with nanotubes, we can see both the incident and transmitted signal. E_p stand for the most probable energy.

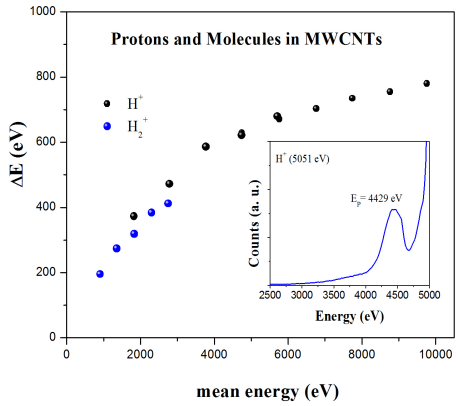

Fig. 1 *Experimental energy loss of protons and molecular fragments from H_2^+ transmitted throught MWCNTs as a function of the mean energy. Inset shows the energy loss spectrum of 5 keV protons.*

The experimental results were analized and compared with Monte Carlo computer simulations and previous theoretical models. The interactions between the external ion and the atoms of the solid are described in the frame of the binary collision model.

References

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