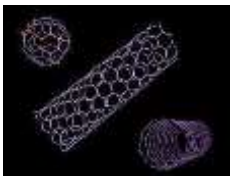

Nanocarbons: a multidisciplinary approach

Nanosciences correspond to recent, very active, multidisciplinary and promising research fields. Their applications will most certainly impact deeply technology, hence economics and eventually society in a near future. This course will deal with a family of nanoobjects of major importance which is the focus of researches in numerous academic fields ranging from chemistry to physics *via*-biology: the nanosized forms of carbon, among which carbon nanotubes.

1st course (07/06 morning) will begin by a first lecture given by **K. GUERIN**, on the different allotropic forms and dimensionality of nanocarbons. Then, the talk will focus on carbon nanotubes: their synthesis through electrochemical, Chemical Vapor and Physical Vapor processes. Their peculiar physicochemical characteristics will be detailed owing mainly to high resolution microscopies and spectroscopies such as Raman and IR. It will end with their use as electrode material in secondary lithium battery and it will be shown more generally how nanostructured materials can deeply enhance the electrochemical performances of such energy system. Then **30 min** will be dedicated to the starting of the tutorial parts. It will be asked to the learners to work in multidisciplary teams on recent publications dealing with dedicated topics on-carbon nanotubes.

2nd course (07/06 afternoon) will be managed by **M. DUBOIS** on the latest connexions of molecular chemistry with the field of nanocarbons in general and nanotubes in particular. At first, noncovalent interactions of small molecules with nanocarbon objects will be adressed. Then, the main part of the lecture will focus on the latest advances of efficient application of chemical reactions (including metal-catalyzed and metal-free 'click chemistry'-inspired approaches) for the covalent grafting of diverse chemical species (small organic molecules, metal complexes, macromolecules) on nanomaterials. Finally, selected applications of functionalized hybrid nanoobjects will be preliminary addressed, as an introduction to the third lecture.

3rd course (08/06 morning) will be made by **P. BONNET** on physical properties of nanocarbons and especially about carbon nanotubes. In a first part, electrical, thermal, mechanical and optical properties will be detailed and discussed in relation with their structures and then, potential applications will be presented. In a second part, the influence of covalent and non-covalent functionalization on the physical properties will be addressed. Finally, properties and applications of polymer/nanocarbon composites will be presented and discussed.

4th course (08/06 afternoon) and last lecture will be done by **E. FLAHAUT** on biotoxicology of carbon nanotubes. It will include some basic information about the measurement of nanoparticles (number of particles) in air. The potential impact of carbon nanotubes on both human health and the environmental will be described. Biomedical applications of carbon nanotubes will finally be presented.

5th course (09/06 morning) and **6th course** (10/06 morning) will be tutorials on the project of the learners with a restitution of their work in an oral presentation for the benefit of the whole group.