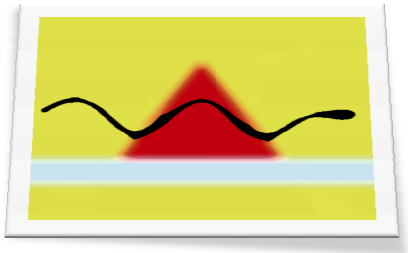
Publishable summary

The aim of the DOTUBE proposal (239256) was the study of the interaction between semiconductor nanoparticles and carbon nanotubes. These systems attract considerable attention due to the photoconductive response arising from the possible photoinduced electron transfer across the interface upon optical excitation. A good understanding of such interaction has been achieved from the synthetic point of view by the studies of the reactivity of CdSe nanoparticles prepared in the absence or presence of chlorinated co-solvents. Furthermore, the effect of chlorine on other nanoparticles-type different from CdSe, such as ZnO, PbS, metals or combination of semiconductor and metals (CdSe and Au) has also been performed.

Furthermore, studies on the ligand environment of nanoparticles and the interface between CdSe nanoparticles and flat graphitic surfaces have been carried out. Two main techniques have been employed, namely: Solid CP/MAS NMR (Cross Polarization/Magic Angle Spinning Nuclear Magnetic Resonance) and X-ray Photoelectron (XPS) spectroscopies. For the later, nanoparticles attached to flat graphitic surfaces have been synthesized as a model to understand the interface of nanoparticles with general carbon graphitic surfaces (carbon nanotubes, graphene, etc..). The combination of these techniques shows valuable information about the interactions taking place between nanoparticles and the solid surfaces. Solid NMR spectra shows noticeable changes between the ligand shell of nanoparticles synthesized in the presence or absence of chlorinated co-solvents that can only be interpreted as the effect of the incorporation of chlorine species in the environment of the nanoparticle surface. The modification of the organic ligand shell by chlorine strengthens the interaction to graphitic surfaces, as demonstrated by the fact that nanoparticles with larger amounts of chlorine on their surface (determined by XPS) decorate the graphitic carbon surfaces more efficiently than particles with lower amount.

Thus, a good understanding of the problem has been achieved, what may help for new design strategies for technologically relevant electrode-semiconductor nanoparticle interfaces where control of the physic dynamics of interacting objects could drive favorable transfer mechanisms.

Out of this grant, a new chemical lab has been partially implemented. A female fellow has been recruited for 7 months. 2 female students have obtained their master thesis in the topic of this proposal. The scientific results have been gathered in 7 peer-reviewed papers and two more that are still not published. The scientific results have been presented by the ERG fellow in international conferences as 9 oral communications and 7 posters. Some of the results have also been spread in the national press.



LOGO (DOTUBE 239256 ERG, 2009-2012)