

Title	Electron Paramagnetic Resonance investigation on new generation organic and hybrid electronic materials.
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Project description:

This research project is focused on the investigation of the photophysics of new materials for organic and hybrid organic-inorganic electronics and photovoltaics. The materials investigated include organic conjugated polymers, fullerene derivatives, organic dyes, carbon nanostructures, organic perovskites and composite materials obtained by blending the above materials with some inorganic semiconductor nanoparticles (TiO₂, ZnO and others) in disordered or layered structures. The investigation will be carried out on bulk materials and on devices based on several different architectures (bulk heterojunction, multilayer, and others). The research work will be mainly carried out using spectroscopic methods, mainly electron magnetic resonance (EPR), aiming at the identification of the main species generated in the material under visible-ultraviolet light absorption (free radicals, charge carriers, excited states) and the processes and interactions between them. From the spectroscopic results, it is expected to obtain information on the structural and electronic factors influencing the photoresponse of the materials.

The research work is done in collaboration with other research groups or the DiSC and additional collaboration with other national and international institutions.

The expected knowledge to be acquired by the PhD student includes a good expertise in EPR spectroscopy, a detailed knowledge of the research field organic electronics.

Publications:

- (1) Privitera, A.; Righetto, M.; Mosconi, D.; Lorandi, F.; Isse, A. A.; Moretto, A.; Bozio, R.; Ferrante, C.; Franco, L. Boosting Carbon Quantum Dots/fullerene Electron Transfer via Surface Group Engineering. *Phys. Chem. Chem. Phys.* **2016**, *18* (18), 31286–31295.
- (2) Cristofani, M.; Menna, E.; Seri, M.; Muccini, M.; Prosa, M.; Antonello, S.; Mba, M.; Franco, L.; Maggini, M. Tuning the Electron-Acceptor Properties of [60]Fullerene by Tailored Functionalization for Application in Bulk Heterojunction Solar Cells. *Asian J. Org. Chem.* **2016**, *5* (5), 676–684.
- (3) Grancini, G.; De Bastiani, M.; Martino, N.; Fazzi, D.; Egelhaaf, H.-J.; Sauermann, T.; Antognazza, M. R.; Lanzani, G.; Caironi, M.; Franco, L.; et al. The Critical Role of Interfacial Dynamics in the Stability of Organic Photovoltaic Devices. *Phys. Chem. Chem. Phys.* **2014**, *16* (18), 8294.
- (4) Camaioni, N.; Tinti, F.; Franco, L.; Fabris, M.; Toffoletti, A.; Ruzzi, M.; Montanari, L.; Bonoldi, L.; Pellegrino, A.; Calabrese, A.; et al. Effect of Residual Catalyst on Solar Cells Made of a Fluorene-Thiophene-Benzothiadiazole Copolymer as Electron-Donor: A Combined Electrical and Photophysical Study. *Org. Electron.* **2012**, *13* (4), 550–559.