

# Investigation of the electronic properties of nanostructured organic films for photovoltaic applications

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The research activity of the “**Electronic and Structural properties of solids**” group at Department of Physics is mainly oriented towards the study of surface and interfaces of solids. In the last years one of the subjects is the study of organic thin and ultra-thin films deposited by ultra high vacuum thermal evaporation. We study the electronic properties of the interfaces by means of electronic spectroscopies (XPS-UPS, both using laboratory and synchrotron sources) and I-V curves.

Recently we moved to study these films for the application in the photovoltaic field. In particular we studied the interaction between CuPc and C<sub>60</sub> molecules when a blend film is prepared, showing that this interaction determines a shift of the HOMO structure of both the molecules, which depends on the blend film composition [1,2]. We have also investigated the effects at the interface between these blend films and some metals, useful for the organic solar cells, like Au and Al.

Since we have also a research activity on the growth and characterization of carbon nanotubes (CNT), that we can grow on metals, we are now trying to realize solar cell using CNTs, as nanostructured charge collectors, surrounded by organic molecules. Using SEM we have already been able to fill quite uniformly the space between the nanotubes with the organic compounds. Moreover we have also studied the CNT/CuPc interface using XPS/UPS spectroscopies.

A part for the XPS/UPS, I-V and SEM techniques, in our laboratory other analytical systems are available, as XRD, AFM, STM, and growth facilities, as high vacuum and ultra-high vacuum chambers for thermal evaporation of organic compounds, evaporation system for the metallization, CVD reactor for the CNT growth.

## References

1. L. Lozzi, S. La Rosa, and S. Santucci, Photoemission investigation on copper phthalocyanine:fullerene blend film, *Appl. Phys. Lett.*, vol. 88, p. 133505 (2006).
2. L. Lozzi, V. Granato, S. Picozzi, M. Simeoni, S. La Rosa, B. Delly and S. Santucci, Electronic structure of CuPc:C<sub>60</sub> blend film, *J. Vac. Sci. Technol. A*, vol 24, p. 1668 (2006).