Molecular design - Growing Functional Nanosurfaces for Organic Electronics

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Understanding and controlling the energy and charge transport phenomena that occur at the nanoscale, especially at the organic-substrate interface is a key challenge to improve organic optoelectronic devices. This interface plays a determining role in device performance. Moreover, as the products of technology get increasingly smaller, controlling the molecular and electronic environment at this boundary is crucial. Major advances have been made via the bottom-up approach to develop controlled molecular systems, seeking to improve electronic conductivity. However, most of the materials developed don't result in effective materials for organic devices.

To overcome this, it is essential to understand that the nanoscale is qualitatively different from the molecular and macro scale, and therefore different strategies and tools towards materials design and analysis must be applied to when investigating the nano-domain. This is why, we are working on the development *of integrated, functional nanostructures* as the basic units that will constitute organic electronic devices instead of functional molecules.

The strategy involves firstly, the design and synthesis of "model" 2D-assemblies from purposefully-designed, "smart" molecular building blocks. These will allow to probe and measure the optoelectronic phenomena taking place at the substrate-organic interface, and therefore bridge the gap in the knowledge concerning the energy and charge-transfer processes present in organic materials at the nanoscale. This could potentially open up the path towards the design of new, self-assembling, functional nanostructures that can be incorporated into *smaller* and *more effective* organic electronic devices.