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ABSTRACT

The electronic structure of unsupported nano-objects has long been of fundamental interest, as abrupt changes and surprising quantum phenomena appear when single atom properties evolve to the collective electronic properties of infinite solids. However, also from the applied point of view the investigation of free-standing nano-sized matter is now more timely than ever: their unique, size-scalable properties are exploited in industrial applications like in fluorescent quantum dots, and nano-objects have been found to be ubiquitous in nature with impact on human health and climate. In either their use for catalysis applications or in naturally occurring chemical reactions of atmospheric nano-aerosols, the electronic structure of the surface critically determines their chemical reactivity. Therefore, studying the structure of the first layers of nanomaterials is of utmost importance, when it comes to surface sensitive techniques probing the electronic structure of matter, there is no other like soft X-ray photoelectron spectroscopy. In this progress report, we will describe some recent soft X-ray spectroscopy studies of unsupported nano-matter carried out at the PLEIADES beamline at the Synchrotron SOLEIL (Saint-Aubin, France). We have been able to follow the oxidation of Si nanocrystals of different sizes in ambient air [1] and *in situ* when nanocrystals were exposed to a thermal treatment (heating) in flight. As a second example, we will present the surface characterization of carbon dots. Being highly biocompatible and fluorescent, they are promising alternatives to metal-based quantum dots for biomedical applications, but there is still a lack of understanding of their structure and of the origin of their fluorescence.

REFERENCES

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