

## **Graphene growth, structure, intercalation and functionalization @ Elettra**

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X-ray photoemission spectroscopy (XPS) with synchrotron radiation, used also in its fast modality to follow transient processes, and combined with theoretical modelling and complementary surface science techniques, is an extraordinary tool capable of exploring several aspects inherent to the chemistry and physics of graphene.

XPS at Elettra Sincrotrone Trieste has been exploited to investigate the growth mechanisms of monolayer graphene on different transition metal surfaces, to study graphene electronic, thermal and structural properties and the interaction with the underlying metal substrate, to follow the functionalization with H and O atoms and the thermal reactions occurring in hydrogenated and oxidized graphene. We have also directly monitored the stepwise intercalation of atomic and molecular species below epitaxial graphene to achieve the chemical synthesis of insulating materials below it, capable to provide electrical decoupling from the metal substrate. This innovative concept opens many design options and might thus have wide application in graphene research and device fabrication.