

# **Driving nanostructures morphology by cluster chemical composition**

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## **Abstract:**

The high surface to volume ratio of nanoparticles can lead to unexpected material properties. One of the most challenging goals in nanoscience research is to benefit from nanoparticles singular properties to elaborate new materials. To reach this, cluster deposition on surfaces appears as a powerful tool.

The controlled building of new architectures at the nanometer scale needs the full understanding of the mechanisms leading to their growth. Dynamics of clusters on surfaces is complex involving many parameters (related to deposition condition, to the cluster, to the substrate and to the interaction between both) and processes, as cluster mobility, coalescence. Experiments dealing with low energy deposition of clusters have demonstrated the possibility to pilot the islands morphologies by monitoring the cluster size and the nature of the surface.

The crucial cluster size effect on the compact or ramified island shape is now well established and understood. And although the presence of a surfactant during thin film growth has been shown to modify the kinetics of film restructuration, nothing is known about the role of cluster chemical composition on nanostructure growth. I will discuss this point in the case of soft-landing onto a graphite surface of silver clusters carrying a small amount of oxide molecules. First I will present the generation of these chemically heterogeneous clusters by reactive nucleation. Then I will show how oxygen incorporated into silver clusters can alter fractal shape or induce a morphological transition of the islands depending on the cluster stoichiometry. This study will highlight how cluster chemical composition (for a given cluster size) offers more degree of freedom to control the film properties, which would not be possible by atom deposition.