X-Ray diffraction and high-pressure spectroscopy on noble metal nanoclusters

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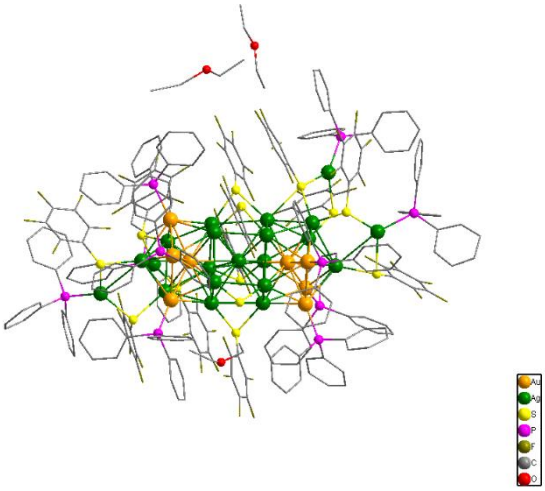
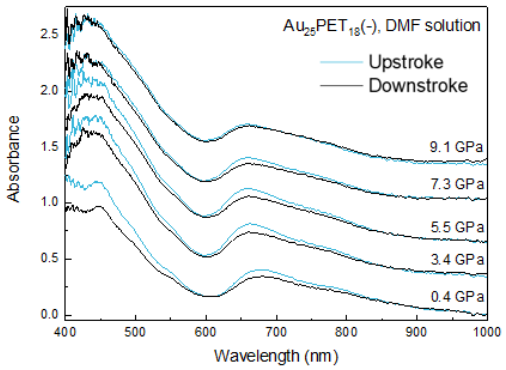
Nanoclusters are a peculiar type of material with sizes ranging between 1 and 3 nm. They exhibit molecule-like properties that make them an interesting bridge between molecules and nanoparticles. These properties make them promising candidates for various applications including in catalysis, bioimaging or sensing [1]. Nanoclusters are atomically precise with a number of metallic atoms ranging from around 10 to a few hundreds and are protected by a shell of organic ligands [1,2].



In order to investigate the structure-size relationship and the evolution of the structure with the size of nanomaterials, new nanoclusters were synthesised and crystallised. Determining the exact structures of these compounds by X-Ray diffraction is essential to a good understanding of their properties and of their stabilising factors. The inter-ligands interactions, the composition and arrangement of the metallic core as well as the origin of the chirality in these materials are all investigated.



The effects of pressure on the optical properties of a series of nanoclusters were also studied by performing several spectroscopic measurements at high pressure. Observations regarding the reversibility of their behaviour before and after applying pressure along with the changes in absorption and Raman spectra are discussed.

[1] M. Zhou, C. Zeng, Y. Chen, S. Zhao, M.Y. Sfeir, M. Zhu. Jin, *Nat. Commun.* **2016**, *7*, 13240.

[2] Jin, R. *Nanoscale* **2010**, *2* (3), 343-362.