

Study of the dynamics of atomically precise silver nanoclusters with the help of NMR spectroscopy

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Nuclear Magnetic Resonance (NMR) spectroscopy^[1] is a powerful tool to study the structure and dynamics of all sorts of chemical compounds including atomically precise gold^[2–5] and silver nanoclusters.^[6,7] For example, some of us have recently studied the intracuster ligand dynamics for the Ag₂₅ and single atom doped Ag₂₄Au nanoclusters using NMR spectroscopy.^[6,7]

In this oral presentation, I will discuss the structure and properties of [Ag₂₉(BDT)₁₂(TPP)₄]³⁻ and [Ag_{29-x}Au_x(BDT)₁₂(TPP)₄]³⁻ NCs (BDT = 1,3-benzenedithiol, TPP = Triphenyl phosphine).^[8] I will focus explicitly on the dynamic properties of the metal core and the ligand shell using NMR spectroscopy (¹H, ³¹P and ¹⁰⁹Ag) at different temperatures (Figure 1). The phosphine ligands are very dynamic at room temperature, desorbing from and re-adsorbing onto the cluster rapidly. At low temperatures the appearance of different ³¹P NMR signals indicates a lowering of the cluster symmetry.

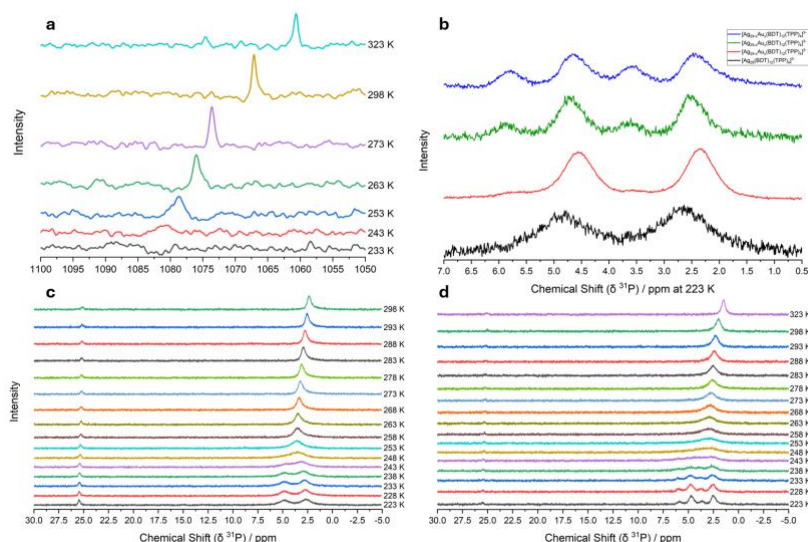


Figure 1. ¹⁰⁹Ag (a) and ³¹P (b) NMR of Au-doped (0 to 20%) and undoped Ag₂₉ nanoclusters at 298 (a) and 223 K (b). ³¹P VT NMR of undoped Ag₂₉ (c) and 10 % Au-doped Ag₂₉ (d) nanoclusters: 223 K to 298 K.

References:

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