Supporting information

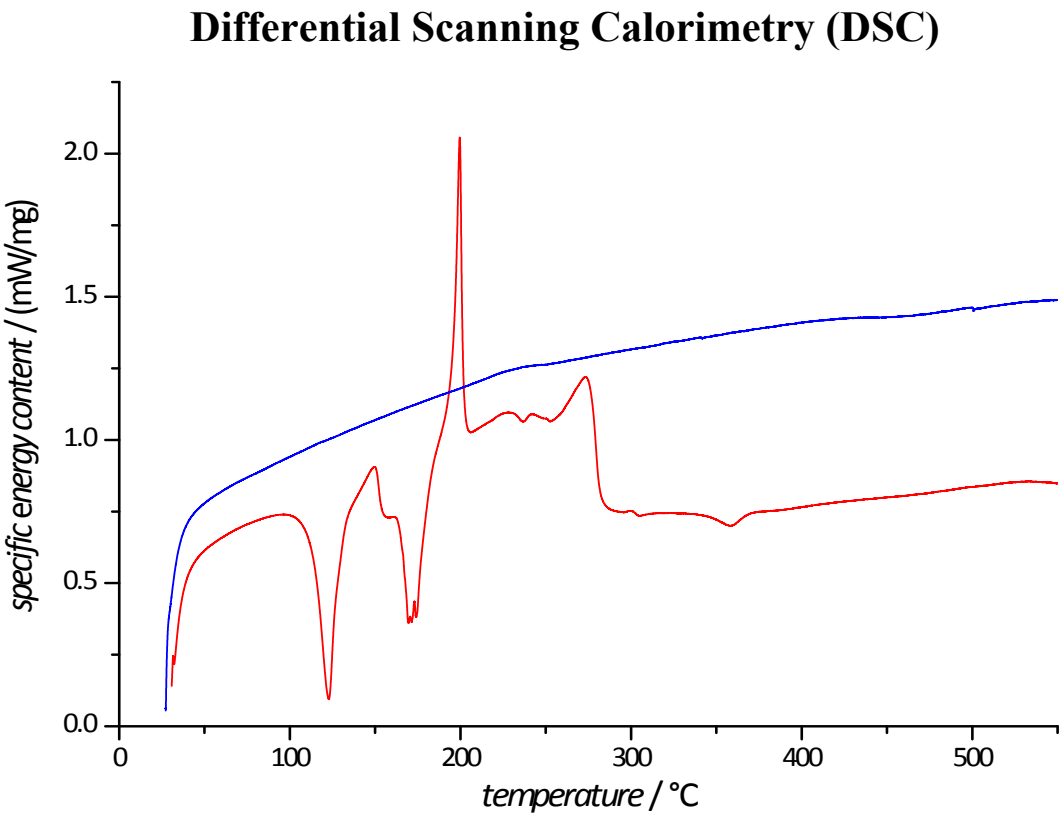

Figure S1. Differential Scanning Calorimetry (DSC) of $Au_{55}(PPh_3)_{12}Cl_6$ clusters. In the first run (red line), from 100°C to 200°C is the oxidation processes on the ligand hull. The melting and agglomeration of Au can be found from 300°C to 400°C which is far beneath the melting temperature of bulk gold and proves that the clusters are present and are melting to give bulk gold. In the second run (blue line), there is no peaks due to the clusters are transferred to bulk gold with a normal Au melting point.

Powder X-ray Diffraction (pXRD)

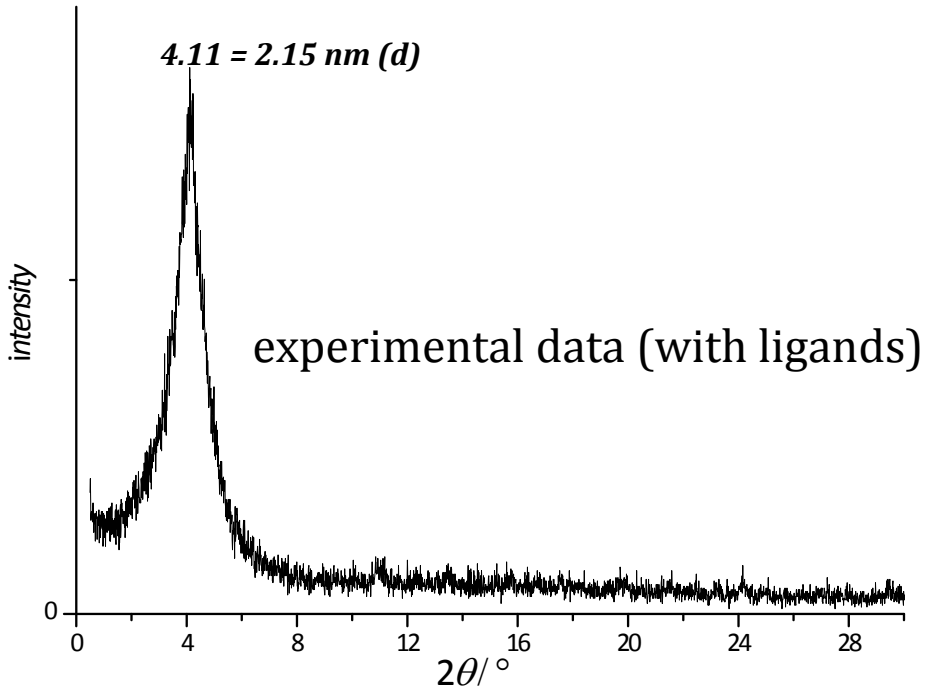

Figure S2. The powder X-ray diffraction (pXRD) of $Au_{55}(PPh_3)_{12}Cl_6$ clusters. A reflex is shown in 4.11°. According to the hexagonal packing of the clusters (as dry solid), the d value for the cluster packing can be calculated as 2.15nm. Which is convinced with the previous study.

Nuclear Magnetic Resonance (NMR)

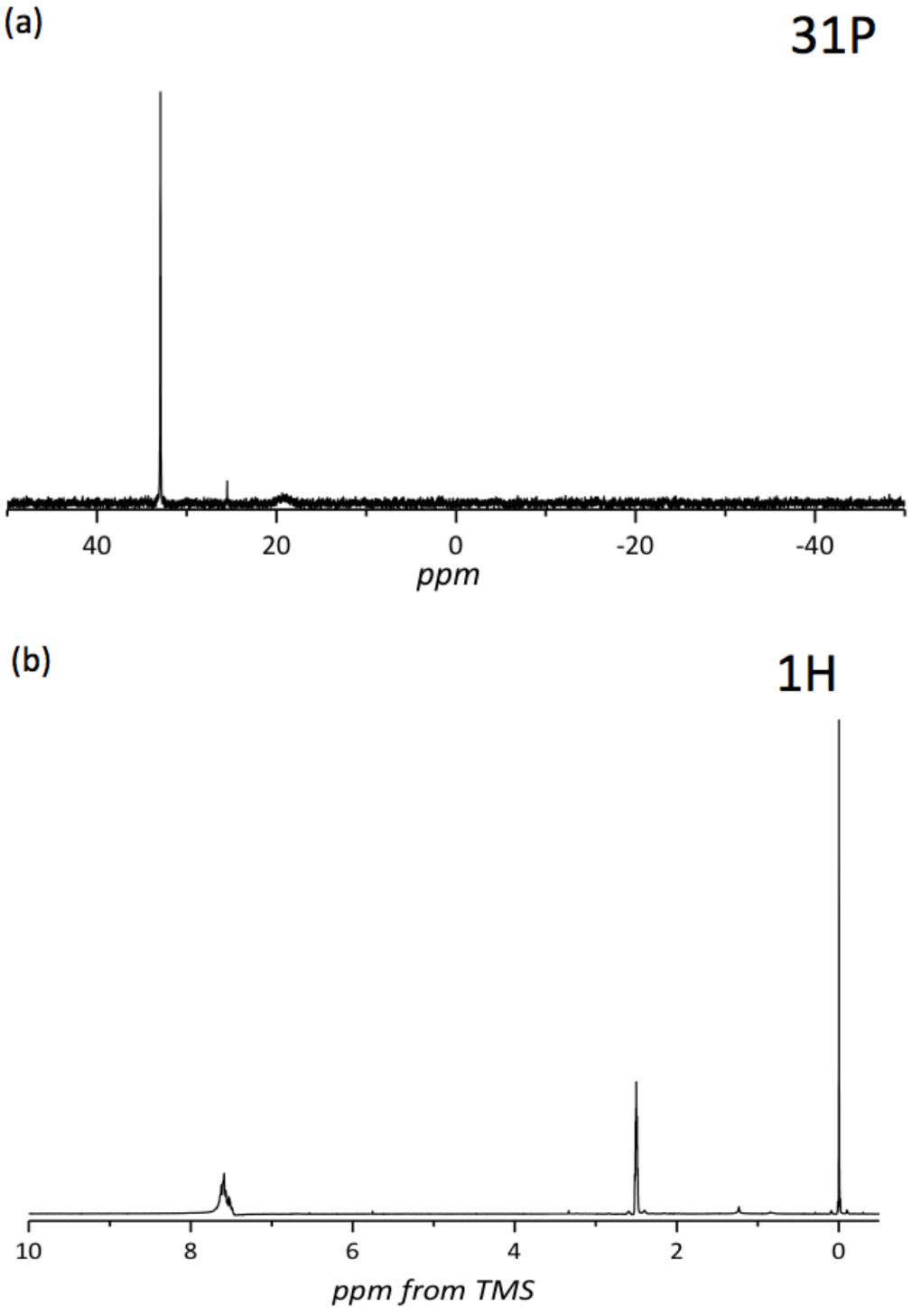

Figure S3. (a)The NMR analysis of ^{31}P shows a signal at 33 ppm, which represents triphenylphosphine ligands that are linked to the cluster. No free ligand signal (should around -10) was observed. Shows stability of the ligand-protected clusters. (b) The NMR analysis of ^{1}H proves the overall presence of the right ligands due to the aromatic signals belong to

triphenylphosphine. The signal around 7.55 ppm shows the aromatic protons form phenylene rests, signal at 2.50ppm is the DMSO signal, the signal at 0 ppm is the TMS reference.

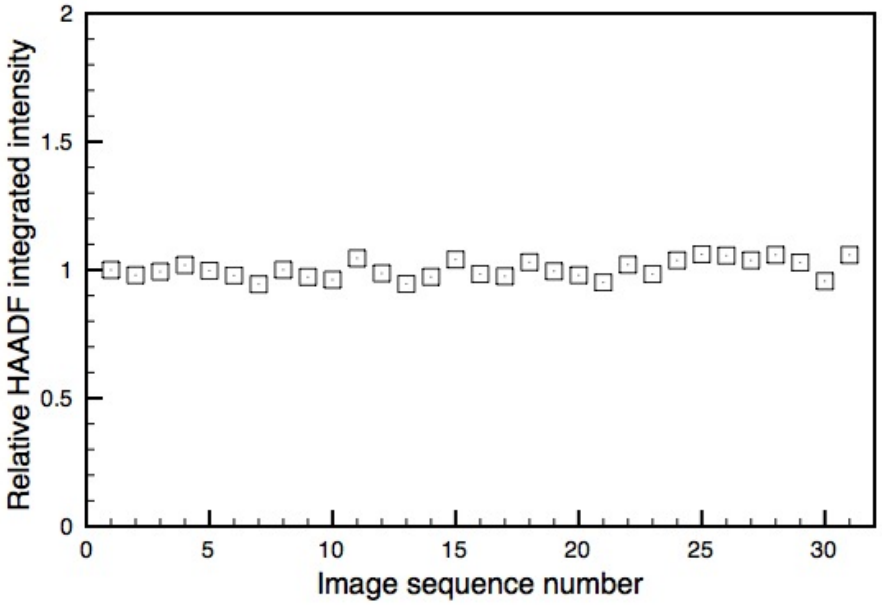

Figure S4. The HAADF integrated intensity of one $Au_{55}(PPh_3)_{12}Cl_6$ cluster as a function of time, obtained from a series of continuously recorded images.