

TEM images of Chemically-Synthesized, Atomically-Precise Gold Nano-Clusters

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Abstract

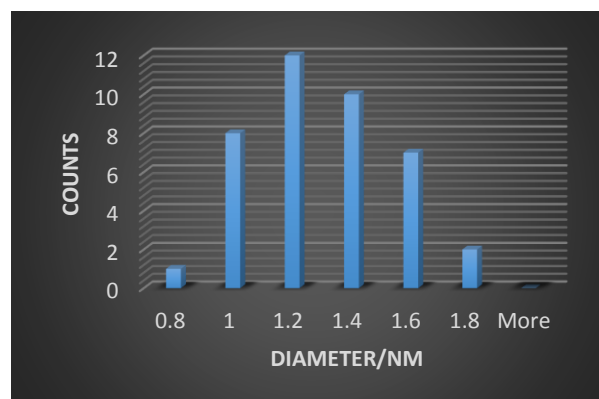
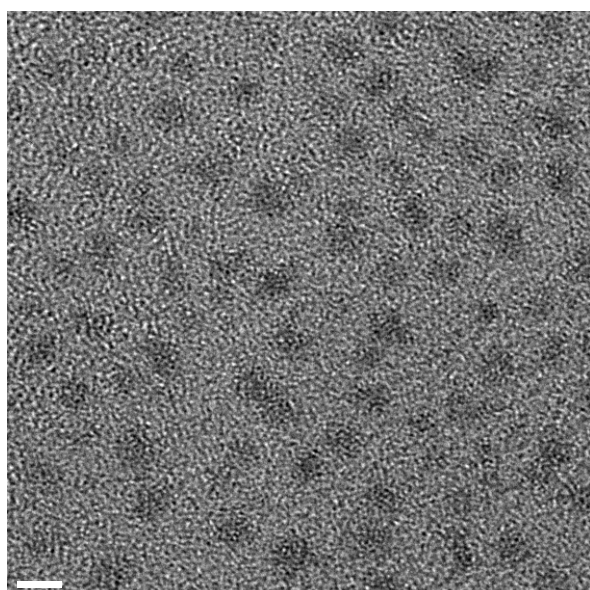
Gold clusters with controlled number of atoms have promising catalytic properties for use in a broad range of reactions, particularly in surface chemistry for the “green” technology [1].

We prepared chemically-made and atomically-precise phosphine-stabilized clusters [2], $\text{Au}_9(\text{PPh}_3)_8(\text{NO}_3)_3$, and Transmission Electron Microscopy (TEM) images of the clusters have been analyzed. TEM observations show all the nanoclusters are spherical and their diameter distribute in the range from 0.8 to 1.8 nm, as shown in the figures below. The average size of 1.2 ± 0.2 nm is in good agreement with theoretically proposed structure of $\text{Au}_9(\text{PPh}_3)_8(\text{NO}_3)_3$ nanoclusters, if we assume the observed contrast of each nanocluster involves peripheral PPh_3 molecules. The relationship between key properties of the clusters (size, geometry and electronic structure) and the catalytic activities cannot be examined by reactivity measurements, structure determination or theoretical calculations alone.

References

- [1] U. Heiz, A. Sanchez, S. Abbet, W.D.Schneider, *Eur. Phys. J. D*, **9** (1999) 35.
[2] D. P. Anderson, et al., *PCCP*, **15**(2013) 3917-3929.

Figures



TEM micrographs and size distribution histograms of Au_9 nanoclusters (bar size is 2nm).