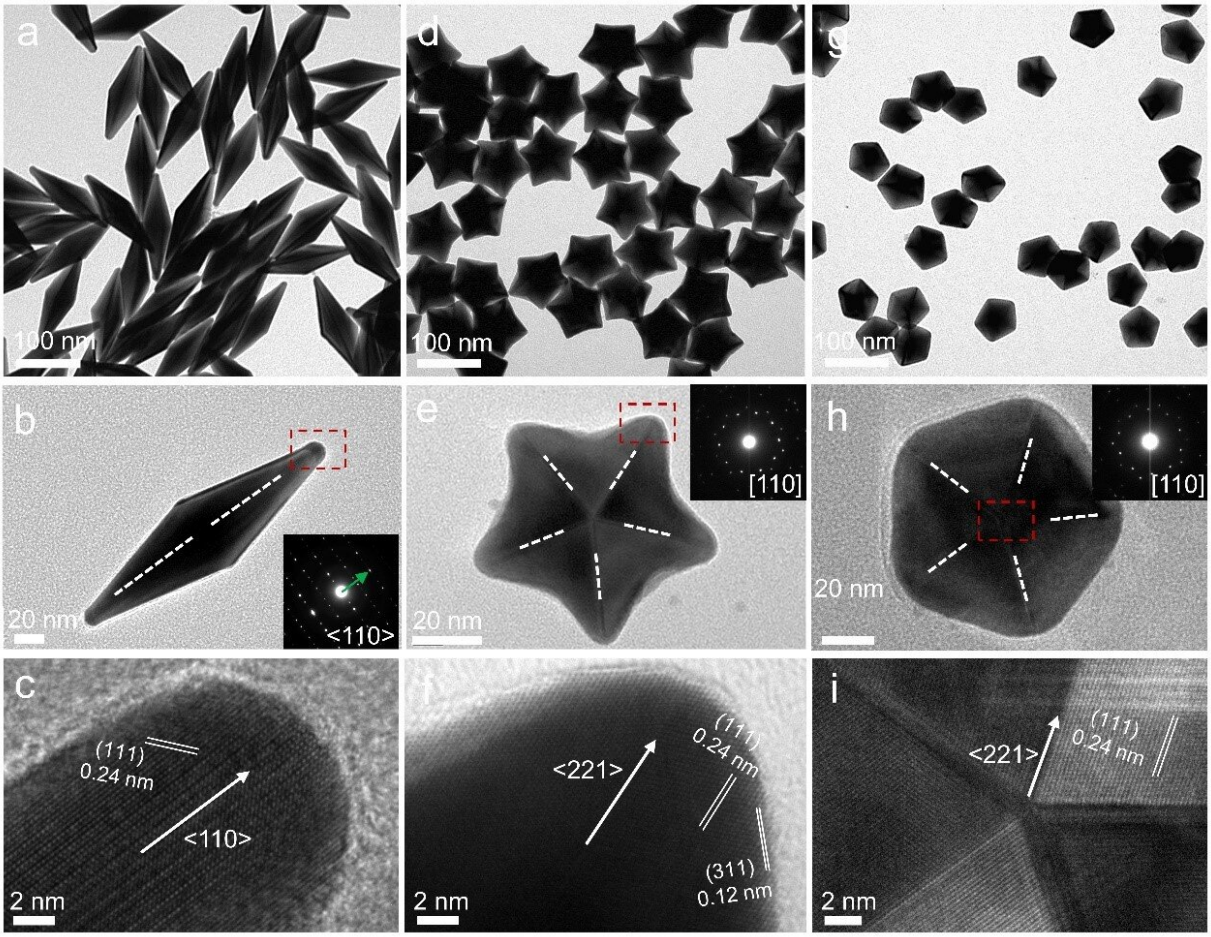
# Researchers achieve universal route to family of penta-twinned gold nanocrystals

October 12 2021, by Zhang Tao




Characterization of three typical penta-twinned Au NCs. Credit: Zhang Tao

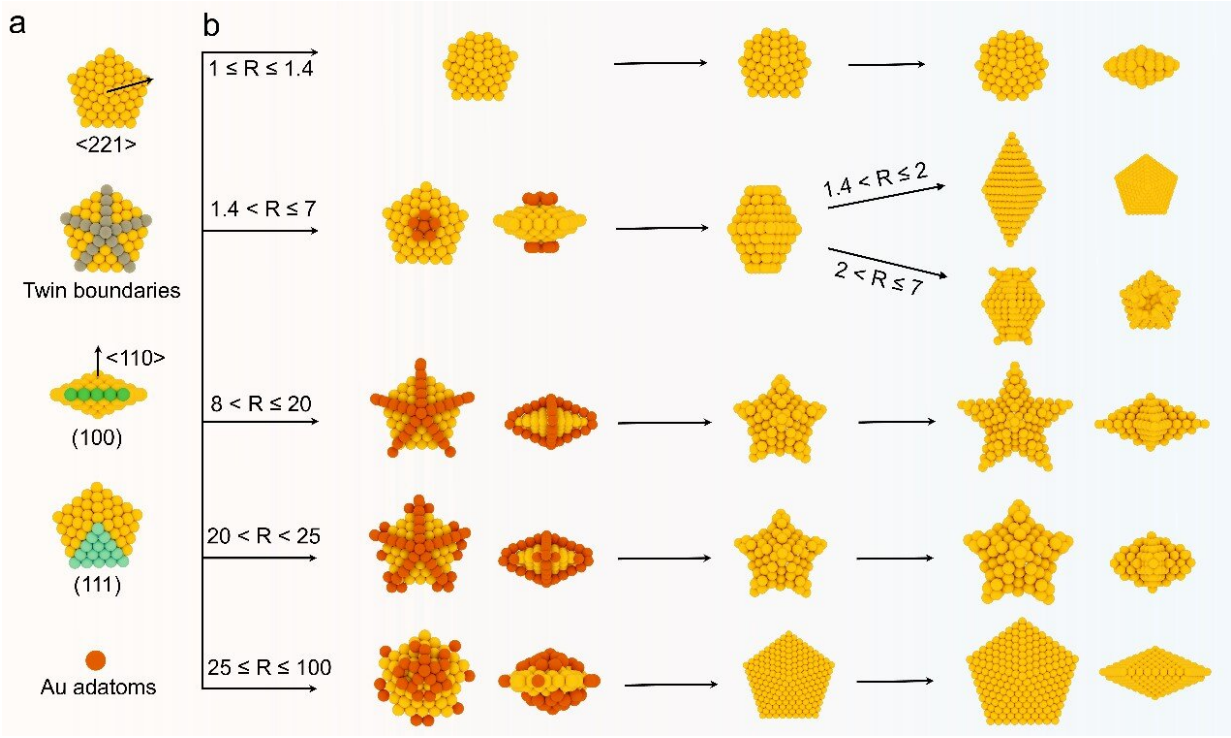
A research team led by Prof. Li Yue from the Hefei Institutes of

Physical Science (HFIPS) of the Chinese Academy of Sciences (CAS), together with Prof. Li Cuncheng from University of Jinan, has recently developed a universal route with fine kinetic control to a family of penta-twinned gold nanocrystals.

Gold nanocrystals (Au NCs) have attracted considerable attention in recent decades due to their unique size- and shape-dependent optical properties. To realize practical applications, a controlled synthesis of Au NCs is greatly of vital importance. Despite many seeded methods have been achieved to synthesize Au NCs, some of the major difficulties hindering the synthesis of different types of colloidal nanocrystals are their complex synthetic methods and the lack of a universal growth mechanism in one system.

In this work, the researchers presented a general kinetically controlled seed-mediated growth method to synthesize the family of Au penta-twinned NCs in one growth system. With modulating atom deposition sites and rates through tailoring the R value (the molar ratio of reductant/Au precursors), seven kinds of penta-twinned nanocrystals with tunable sizes and high purity were fabricated.

According to them, this strategy can be further used in the growth of a second metal (silver) on Au decahedral seeds with tunable optical absorbance from visible to Near-infrared range. More importantly, it does not require purification treatment and additional metal ions, greatly simplifying the synthesis process.




Schematic of the kinetically controlled growth mechanism of different kinds of penta-twinned nanostructures. Credit: Zhang Tao

The general method proposed here not only developed an effective kinetically controlled strategy to the family of penta-twinned NCs, but also gave a deep understanding on a universal mechanism for their formation, which may guide us to synthesize NCs in a designed mode.

The research has been published online in *Chemical Science*.

**More information:** Tao Zhang et al, A universal route with fine kinetic control to a family of penta-twinned gold nanocrystals, *Chemical Science* (2021). DOI: 10.1039/D1SC03040J