Colloidal PbTe-Au Nanocrystal Heterostructures

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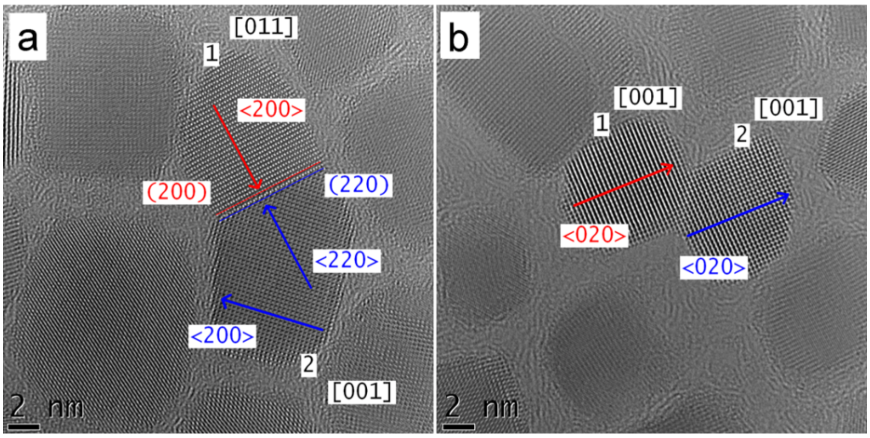
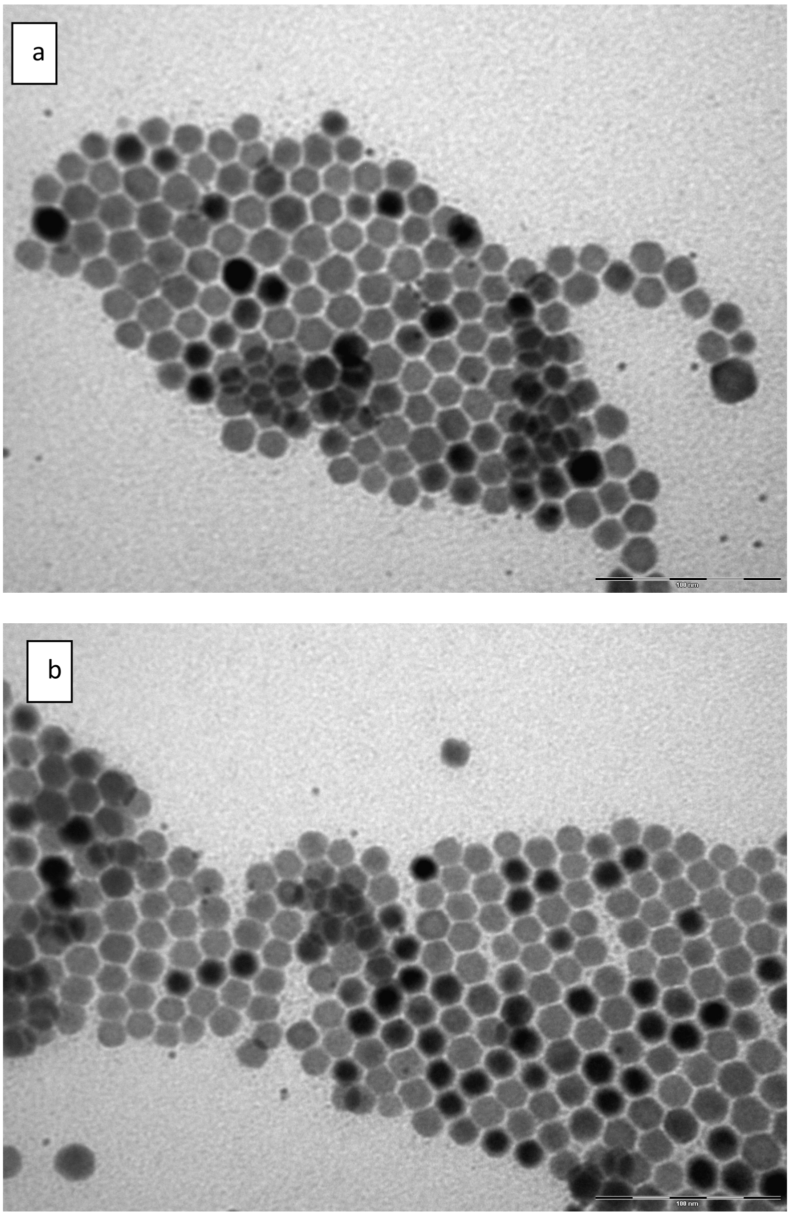
Supporting Information

Figure S1. TEM images of dimeric structures occasionally found in the "close to cubic-shaped" PbTe nanocrystals that were formed when pumping was applied.



A typical dimeric structure was characterized by two nanocrystals with different orientations and is shown in **Figure S1a**. The nanocrystal numbered as "1" presents a pseudo-hexagonal symmetry consistent with a [011] axial projection of a *fcc* lattice, with the direction <200> perpendicular to the (200) facet, the latter acting as first interface. The nanocrystal numbered as "2" has a different orientation: its square symmetry is consistent with a [001] *fcc* axis projection, where the <220> direction is perpendicular to the (220) facet, which acts as second interface. It is then possible to identify two contact interfaces, namely (200) and (220) for nanocrystal 1 and 2, respectively. Moreover, the nanocrystals have equivalent <200> directions forming an angle of 45°. The second case is represented by nanocrystals formed most likely via oriented attachment and is shown in **Figure S1b**. Here, two fused PbTe nanocrystals have the same <020> crystallographic orientation and are in the same [001] *fcc* axis projection. It is not possible to distinguish a net interface, so the two nanocrystals can be considered as a forming a single object.

Figure S2. Reaction of PbTe nanocrystals with the $AuCl_3$ solution at room temperature.



Typical TEM images of PbTe nanocrystals reacted with the $AuCl_3$ solution at room temperature. Only the nucleation of small isolated gold nanoparticles in solution was observed, and no substantial variation in the size/shape of nanocrystals was detected, even if the reaction was allowed to run for several hours.

Figure S3. XRD pattern from a sample of pseudo-cubic shaped PbTe nanocrystals coated with a thick amorphous shell (see Figure 1 in the paper), and fit of the pattern by the program FULLPROF.

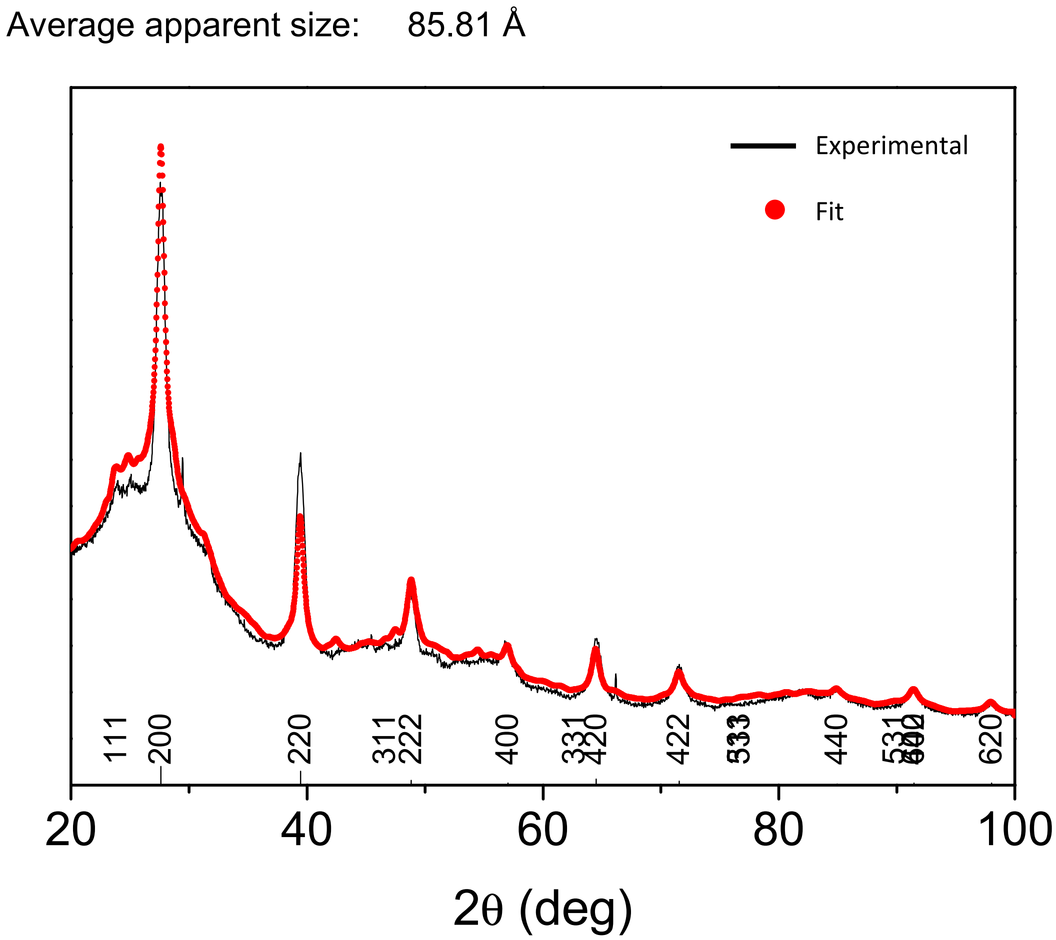


Figure S4. XRD pattern from a sample of pseudo-cubic shaped PbTe nanocrystals coated with a thick amorphous shell, after they are reacted with the $AuCl_3$ solution for 5 min at 90°C (see Figure 3 in the paper), and fit of the pattern by the program FULLPROF.