Supplementary Material (ESI) for Nanoscale
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Growth of Pentatwinned Gold Nanorods into Truncated Decahedra

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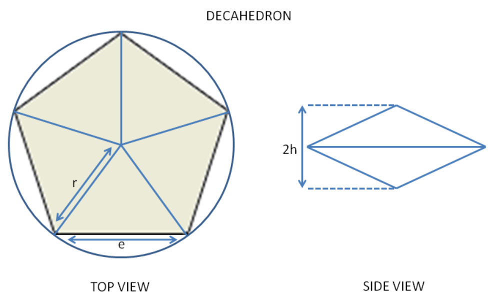
Electronic Supplementary Information

Table S1. Average dimensions (length and width) and aspect ratio of the nanoparticles obtained after growing pentatwinned Au nanorods using different [$HAuCl_4$]:[Au seed] ratios (R).

R	Length (nm)	Width (nm)	Aspect ratio
0	124.4±5.6	23.9±1.7	5.2±0.5
5.3	130.7±3.4	69.4±2.7	1.9±0.1
8.5	124.6±8.7	98.2±3.1	1.3±0.1
9.7	130.5±12.1	107.0±5.8	1.2±0.1
14.0	131.8±5.2	111.2±5.0	1.2±0.1
19.6	145.9±7.8	141.2±7.3	1.0±0.1
23.6	150.6±6.6	142.2±6.4	1.06±0.04
38.7	147.5±9.6[1]	238.7±15.5[2]	0.62[3]
38.7		235.8±21.9[4]	



In a regular decahedron: $h = \frac{e}{10}\sqrt{50 - 10\sqrt{5}};\; r = \sqrt{e^2 - h^2}$

[1] e measured; $h = \frac{e}{10}\sqrt{50 - 10\sqrt{5}}; 2h = Length$

[2] e measured; $h = \frac{e}{10}\sqrt{50 - 10\sqrt{5}}; r = \sqrt{e^2 - h^2}; 2r \approx Width$

[3] $AR = \frac{Length}{Width} \approx \frac{2h}{2r} = \frac{h}{r}$

[4] r measured; $2r \approx Width$

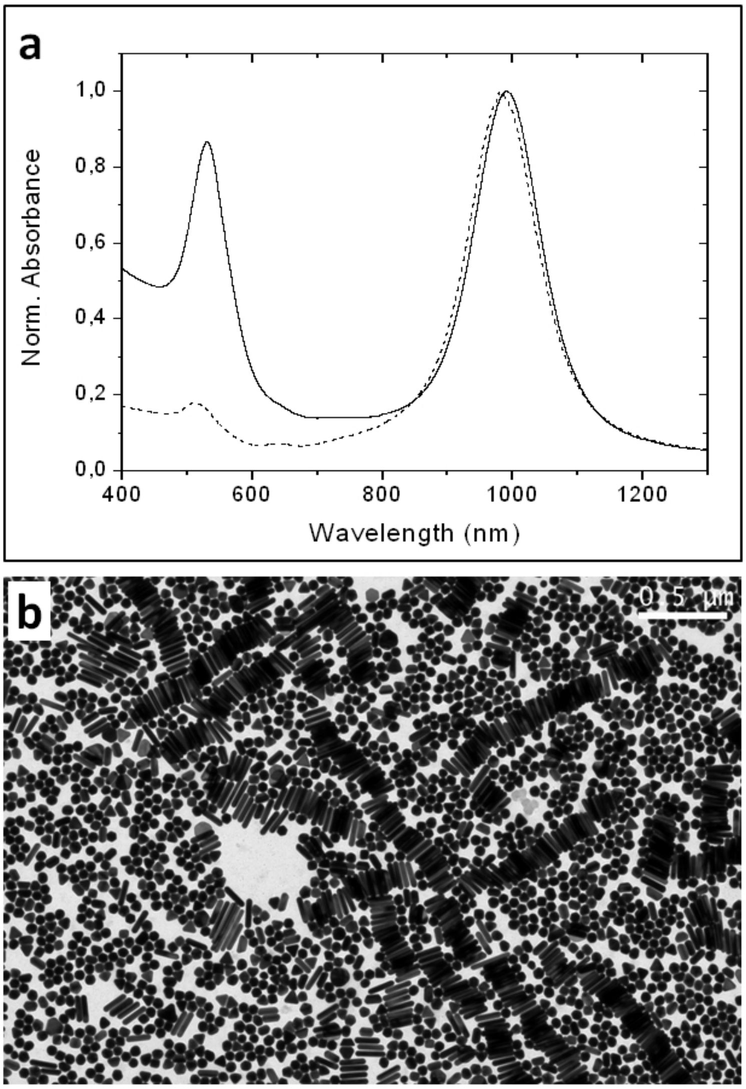


Figure S1. (a) Visible-NIR extinction spectra of gold nanorods before (solid line) and after purification (dashed line). For comparison, the spectra were normalized at maximum intensity. (b) Representative TEM image of the pentatwinned nanorod sample prior to purification.

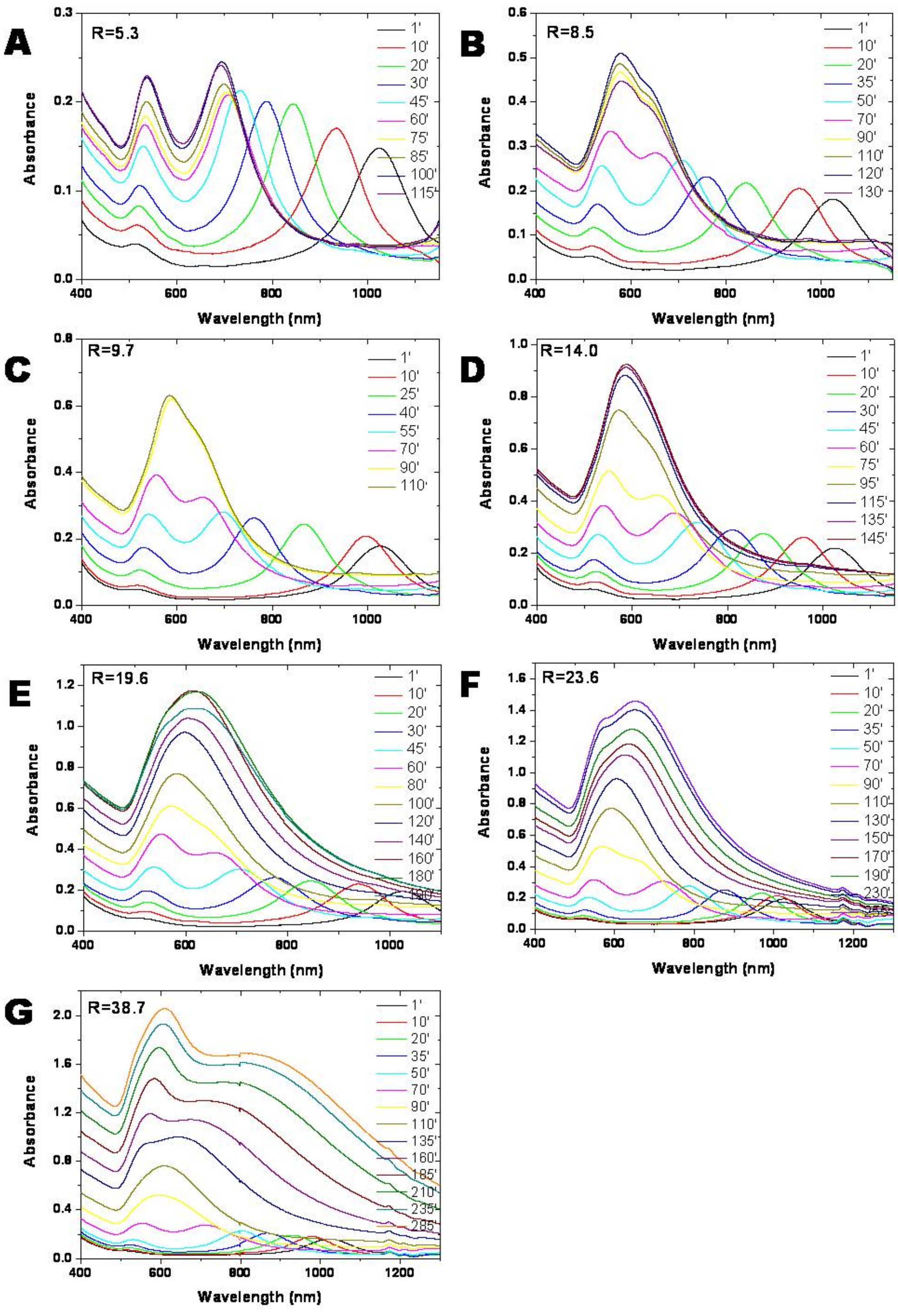


Figure S2. Time evolution of the visible-NIR extinction spectra during the growth of pentatwinned Au nanorods with different [$HAuCl_4$]:[seed] ratios (R) as indicated: (a) 5.3, (b) 8.5, (c) 9.7, (d) 14.0, (e) 19.6, (f) 23.6, and (g) 38.7.

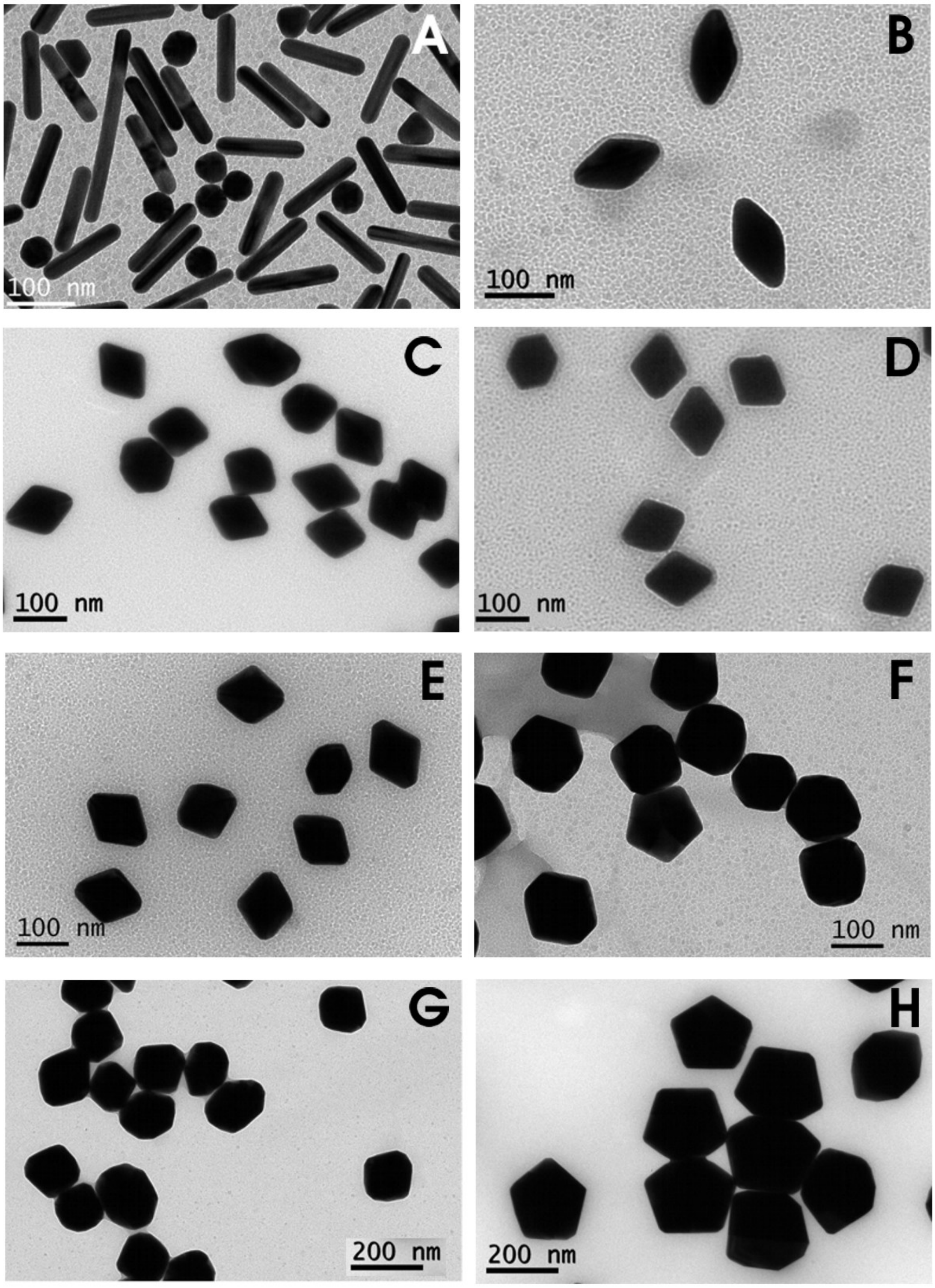


Figure S3. TEM micrographs of pentatwinned Au nanorods and particles grown via reduction with different R values: (a) 0, (b) 5.3, (c) 8.5, (d) 9.7, (e) 14.0, (f) 19.6, (g) 23.6 and (h) 38.7.

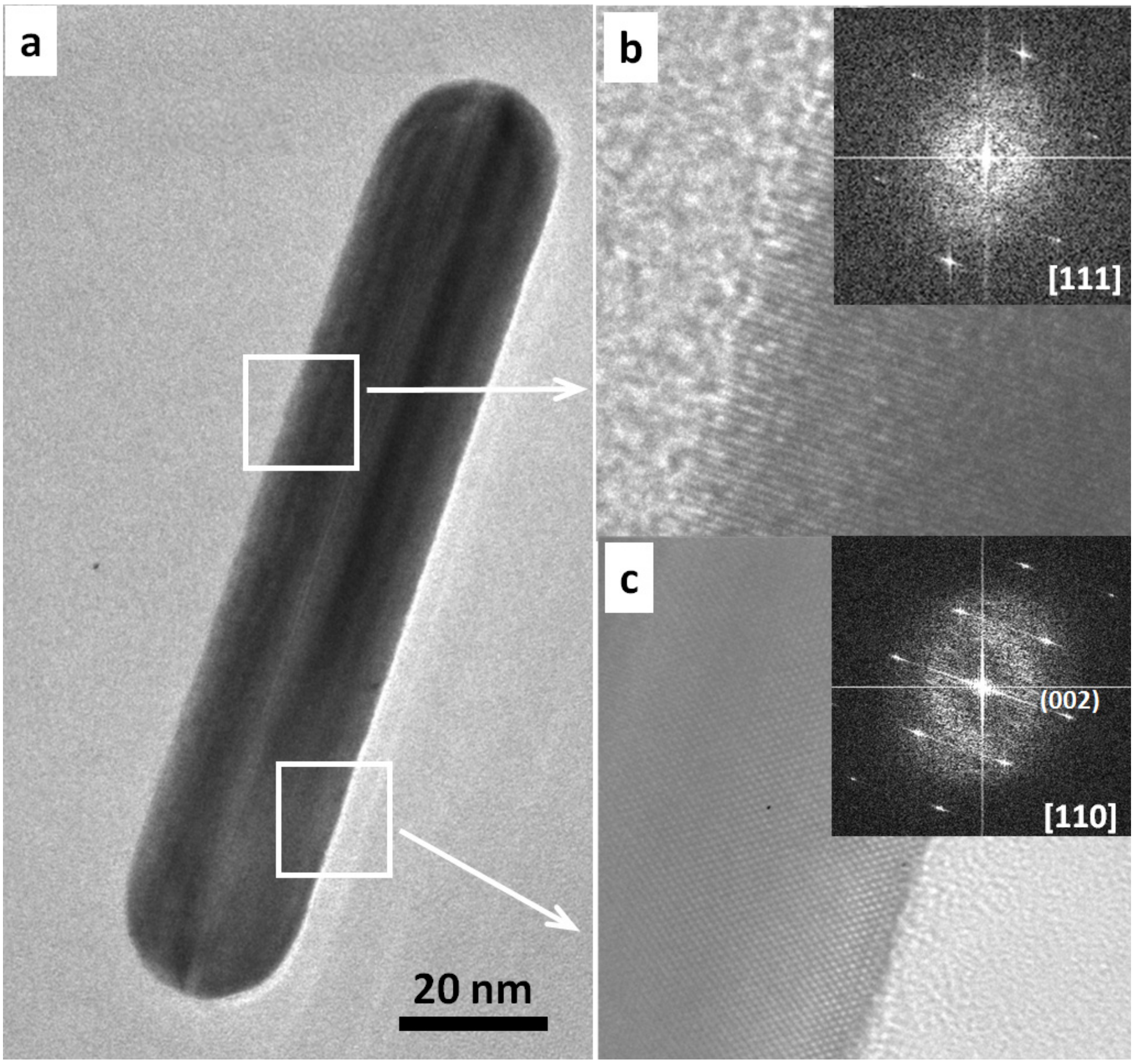


Figure S4. (a) TEM micrograph of a pentatwinned Au nanorod in the <110> and <111> zone axes and HRTEM micrographs of the two selected areas indicated in (a). The insets in b and c) show the corresponding Fourier transformations, which indicate that the left side corresponds to an <111> zone axis and the right to an <110> zone axis. This reveals that only in the right side the {100} facet is actually parallel to the electron beam.

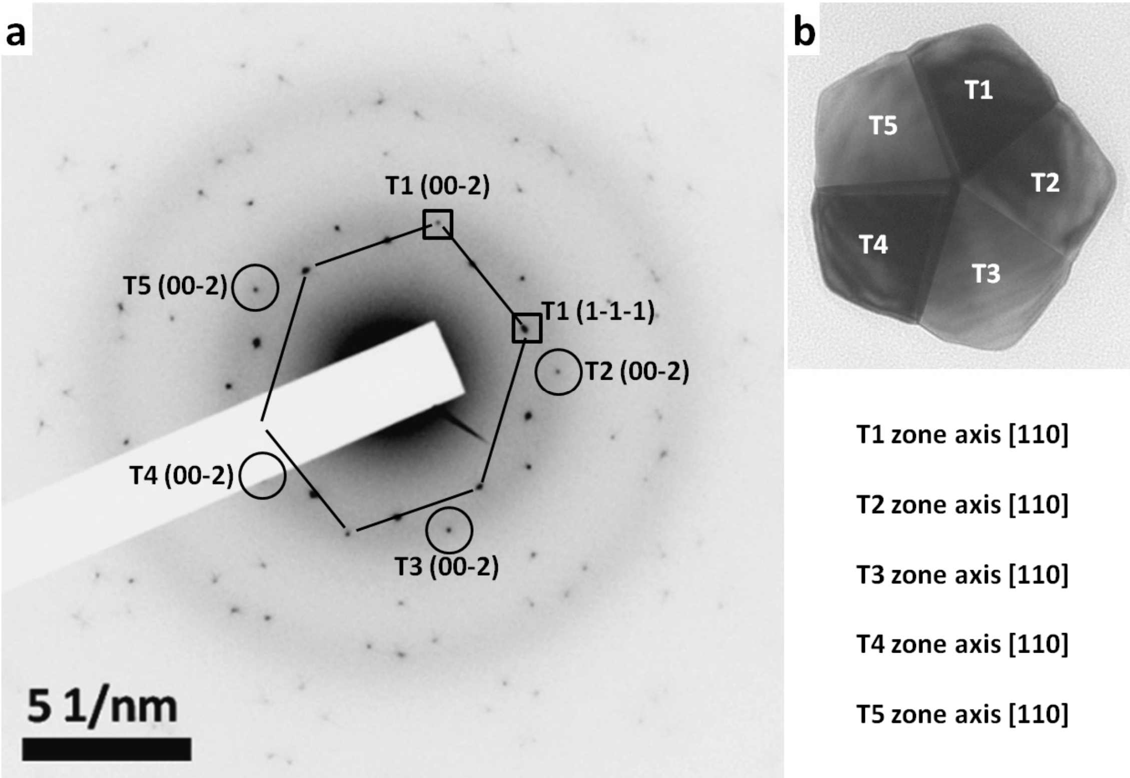


Figure S5. Indexation of the SAED pattern shown in Figure 5a (main body of the paper). The five twins are oriented in the common [110] zone axis. For clarity, only the net of spots corresponding to twin T1 is resolved and the (00-2) spots of each twin are indicated. Twin numbers correspond to the twins indicated in the TEM image. In plane rotation of SAED pattern was compensated.

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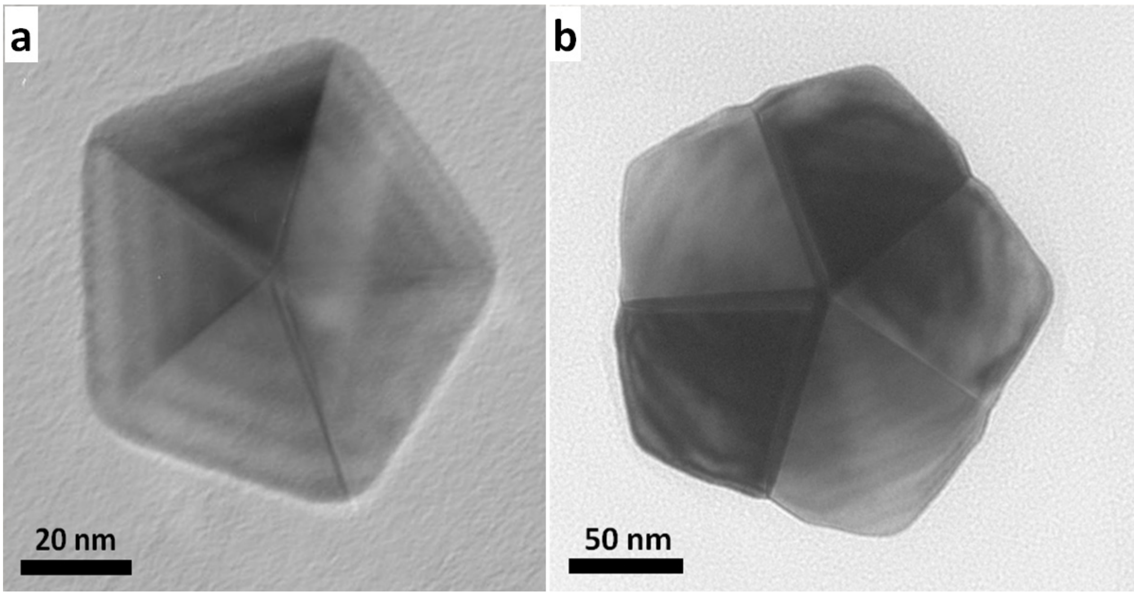

Figure S6. TEM micrographs of a perfect decahedron (left) and a truncated decahedron (right) obtained upon growth of pentatwinned gold spheres and rods, respectively. While in the perfect gold decahedron the twinning planes end up at the apexes, in the truncated decahedron the twinning planes end at the centre of the pentagon edges. Both particles are pentatwinned and show a pentagonal projection. Note the scale difference.