Supporting Information:

1. Volume of unmodified nanoparticle:

We describe the particle as a truncated tetrahedron as pictured below. V_{bot} is the volume of the truncated tetrahedron (i.e., the nanoparticle), V_{tetra} is the volume of the untruncated tetrahedron (constructed using the particle as the base), and V_{top} is the volume of the tetrahedron that is above (on top of) the particle. These volumes are related to the structural parameters of the particle using the following equations:

(1) $$V_{bot} = V_{tetra} - V_{top}$$

(2) $$V_{tetra} = \frac{2}{27}\sqrt{6}a_{bot}^3$$

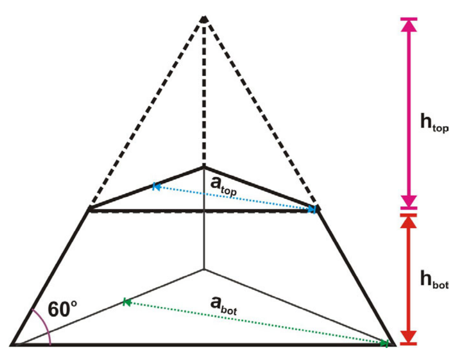
(3) $$a_{top} = a_{bot} - \frac{3\sqrt{2}}{4}h_{bot}$$

(4) $$h_{top} = \frac{2\sqrt{2}}{3}a_{bot} - h_{bot}$$

(5) $$V_{top} = \frac{1}{3\sqrt{3}}a_{top}^2 h_{top}$$

(6) $$V_{top} = \frac{2\sqrt{6}}{27}(a_{bot} - \frac{3\sqrt{2}}{4}h_{bot})^3$$

(7) $$V_{bot} = \frac{2\sqrt{6}}{27}[a_{bot}^3 - (a_{bot} - \frac{3\sqrt{2}}{4}h_{bot})^3]$$



The parameters are defined as follows: a_{bot} is the in-plane width of the nanoparticle, h_{bot} is the out-of-plane height of the nanoparticle, h_{top} is the height of the top of the tetrahedron not including the volume taken up by the particle, a_{top} is the in-plane width of the top volume of the tetrahedron. In deriving these expressions we have assumed that the tetrahedron is a regular tetrahedron in which each face is an equilateral triangle.

2. Volume of an Electrochemically Modified Particle:

We assume that the oxidized nanoparticle (see figure below) consists of a trigonal prism on the bottom, and the unmodified truncated tetrahedron on the top, with the height and width of the trigonal prism determined by the volume change associated with the oxidation process such that the top of the prism and the bottom of the unmodified truncated tetrahedron coincide. Since the top triangular face of the original particle and the out-of plane height of the particle remain constant, we have $a_{top}^{'} = a_{top}, h_{top}^{'} = h_{top}$, $h_{bot}^{'} = h_{bot}$. With these assumptions, the volume of the oxidized particles is the sum of the trigonal prism volume V_1, and the volume V_2 of the remaining portion of the truncated tetrahedron.

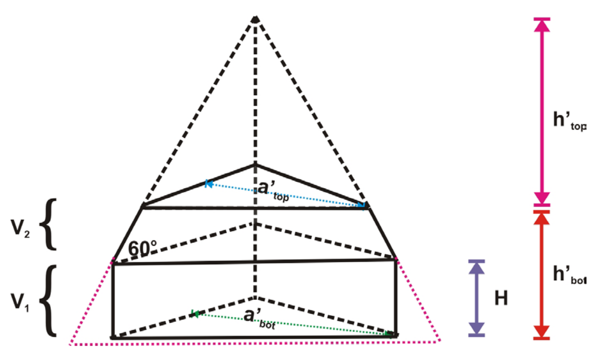
(1) $$V_{bot}^{'} = V_1 + V_2$$

(2) $$V_1 = \frac{Ha'^2_{bot}}{\sqrt{3}}$$

(3) $$V_2 = \frac{2\sqrt{6}}{27}\left(a'^3_{bot} - a'^3_{top}\right)$$

(4) $$H = \frac{2\sqrt{2}}{3}\left(a_{bot} - a'_{bot}\right)$$

(5) $$V_{bot}^{'} = -\frac{4\sqrt{6}}{27}a_{bot}^{'\,3} + \frac{2\sqrt{6}}{9}a_{bot}a_{bot}^{'\,2} - \frac{2\sqrt{6}}{27}\left(a_{top}^{'}\right)^3$$



The parameters in these expressions are defined as follows: a_{bot}' is the in-plane width of the nanoparticle (also the width of the trigonal prism), h_{bot}' is the out-of-plane height of the nanoparticle, h_{top}' is the height of the top of the tetrahedron not including the volume taken up by the particle, a_{top}' is the in-plane width of the top volume of the tetrahedron, and H is height of the trigonal prism.