Abstract Submitted
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Study of growth mechanism and atomic structure of Au-Pd core-shell nanocube by Cs-corrected scanning transmission electron microscopy[1] NABRAJ BHATTARAI, GILBERTO CASILLAS, ARTURO PONCE, MIGUEL JOSE-YACAMAN, The University of Texas at San Antonio — Au-Pd core-shell nanocubes of controlled sizes from 14 nm to 30 nm were synthesized using seed mediated growth process. The Pd shell layers were controlled from some monolayers to 10 nm. The stepwise growth mechanism from nucleation and growth of Au nanoparticles to final core-shell nanocube was studied by using conventional transmission electron microscopy (TEM) and Cs-corrected scanning transmission electron microscopy (STEM). It was found that the nanocubes grew from octahedral Au seeds due to fast growth along <111>directions and concavity occurred because of high reduction rate of ascorbic acid (AA). The concave nanocube showed a change in strain-release mechanism as the Pd shell grew from a few layers to a 30 nm nanocube. Shockley partial dislocations (SPD), stacking faults (SF) and edge dislocations were found to be the mechanism to release the mismatch strain. Also, those concave nanocubes present high index facet surfaces which are found to be more active than low index facet surfaces. Moreover, the smallest size nanocube with HIFs will be suitable in order to maximize the catalytic activity per unit weight and mass specific activity.

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