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PARASITIC SYNTHESIS OF GOLD NANO-MITE GROWTH

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Abstract:
Metal nanoparticles exhibit localized surface plasmon resonance (LSPR), the collective oscillations of surface electrons due to interactions with an electromagnetic field. When focused into sharp points and high-aspect ratio branches, LSPR produces local electric field enhancements. Branched nanoparticles synthesized to take advantage of this enhancement have issues of aggregation in solution and top down approaches are expensive and time consuming. To balance these, nano-mite structures have been synthesized onto prefabricated substrates. Substrates are formed through the evaporation of gold through a polystyrene bead mask. Previous work demonstrated the reaction viability of gold chloride to be reacted with HEPES and hydrochloric acid, silver nitrate and ethanolamine are then added simultaneously in a one-pot synthesis procedure. Current work is demonstrating that a new reaction using gold chloride, reacted with Triton-X, sodium borohydride, ascorbic acid and silver nitrate has similar promise and growth abilities. When temperature is used to control nucleation and growing conditions, limited control over the structures is achieved. Nucleation is slowed using a dry-ice and isopropanol bath. Nucleation and growth at a low temperature allows for slowed Ostwald ripening forming sharper crystalline structures. Structures are characterized using UV-visible spectroscopy, Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM) and RAMAN.