

# Synthesis Mechanisms of Organized Gold Nanoparticles: Influence of Annealing Temperature and Atmosphere

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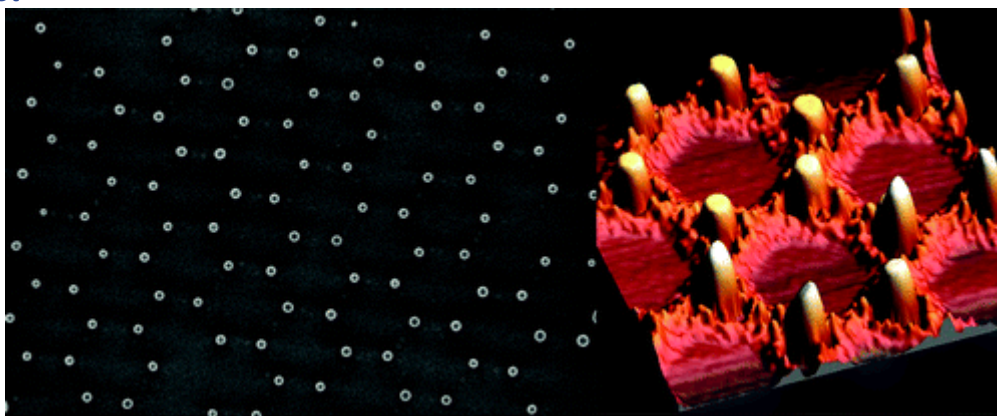
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## Abstract



We report on the synthesis of organized arrays of gold (Au) nanoparticles on thermally oxidized Si wafers using sputtering as a metal deposition method in combination with sphere lithography. This simple process leads to the formation of a honeycomb mask of Au at room temperature (RT). We study the transformation mechanism of this honeycomb mask to a hexagonal array of Au nanoparticles by annealing at different temperatures and in different atmospheres. The underlying mechanisms of pattern formation during annealing are coalescence of particles and Ostwald ripening and depend on temperature and atmosphere. The crystallinity and orientation of the nanoparticles with respect to the underlying substrate is analyzed by electron backscatter diffraction (EBSD), and the control of the morphology, size, shape, and orientation in different atmospheres (argon (Ar), nitrogen (N<sub>2</sub>), air, hydrogen (H<sub>2</sub>), and vacuum) is discussed.