Team describes versatile in situ method to prepare plasmonic gold nanoparticle arrays

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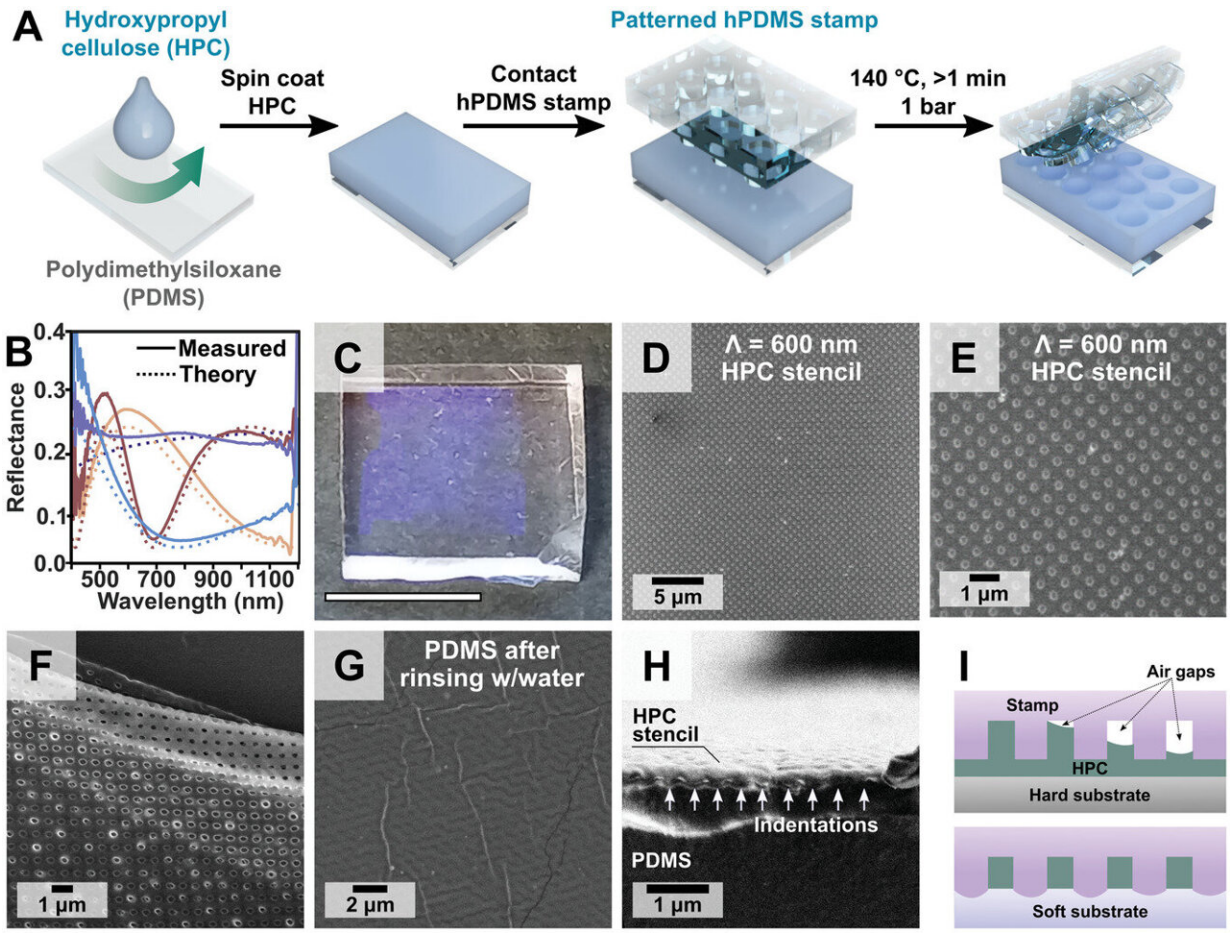

Credit: Gail A. Vinnacombe-Willson et al, *Advanced Materials* (2022). DOI: 10.1002/adma.202205330

Researchers have published work in *Advanced Materials* describing a rapid and simple method to form ordered arrays of gold nanoparticles with plasmonic properties.

Plasmonic nanoparticles prepared by colloidal chemistry have advantageous electronic, optical and magnetic properties, but their implementation into functional devices remains limited by time-consuming and hard-to-scale steps like ligand exchange, purification and self-assembly.

In this work, researchers from the Institute of Materials Science of Barcelona (ICMAB, CSIC) and the University of California, Los Angeles (UCLA), demonstrate the preparation of gold nanoparticle ordered arrays directly on substrates using an unconventional bottom-up wet-chemical synthetic approach.

The researchers applied thermal nanoimprint lithography to fabricate ultra-thin (100 nm) cellulose stencils on polymer substrates, which were used to generate growth-positive and growth-negative areas. The chemical contrast directed the nucleation and growth of plasmonic colloids to specific areas, enabling the rapid production of ordered plasmonic arrays.

Nanoparticle morphology and array periodicity can be tuned easily using this methodology, and the prepared substrates sustain lattice plasmon resonances, which had not yet been achieved using purely in situ chemical reduction.

This work was led by ICMAB researcher Leonardo Scarabelli, with the participation of Agustín Mihi and Yilli Conti from ICMAB.

The in situ growth method presented here represents a versatile platform for the development of wet-chemical shape control and selective surface

growth, providing new pathways for the rational design of new plasmonic, magnetic, and catalytic metamaterials.

More information: Gail A. Vinnacombe-Willson et al, Surface Lattice Plasmon Resonances by Direct In Situ Substrate Growth of Gold Nanoparticles in Ordered Arrays, *Advanced Materials* (2022). DOI: 10.1002/adma.202205330

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