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Nanoreactors directed patterning of gold particles in environmentally responsible systems

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Advance in hybrid 'hard'/'soft' materials design needs constant and exquisite efforts with energy challenges.

As such, versatile and "environmentally responsible" routes are highlighting to achieve patterning of noble gold particles (AuPs) via an asymmetric liquid-crystalline (LC) amphiphilic di-block PEO-*b*-PMA(Az) structure-mediated strategy. Selective immobilization of AuPs into the hexagonally packed hydrophilic poly(ethylene oxide) (PEO) phase-segregated cylinders of the pre-patterned copolymer scaffold is concerned.

Eco-aware treatment dealing with the use of carbon dioxide is reported as a way for depositing pre-formed gold particles into the generated nanoporous template. Original pattern deliveries are conducted through rigorous thermodynamic, diffuso-mechanical, geometric, and chemical criteria. Discussions deal with the specific interactions in LC/solvent (liquid, gaseous and supercritical carbon dioxide medium) systems; the surface topology modulation of the template-mediator concomitantly with the swelling of the CO_2-modified nanophase-separated organization; the "decorative" AuPs distribution modulation with the chemical function of the protected AuPs (hydrophilic gold and aqueous colloidal solution).

The fine thermo-diffuso-chemo-mechanical interactions illustration would provide an essence of a two-dimensional (2D) nanocrystal growth. Such a nontrivial study can be illustrated on catalyst systems. The gold ions locate inside PEO, one nucleation site giving rise to one cell growth stage.

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