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Exploration of soft oxometalates in patterning and allied studies

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Soft oxometalates or SOMs are the heterogeneous dispersions formed by polyoxometalates of colloidal length in solutions. SOMs can be considered as a phase of oxometalates lying at the lower extreme of concentration or volume fraction regime. These are intermediate of molecular POM solutions and their crystalline counterparts. In this presentation, we shall depict controlled nucleation of SOMs to form microdimensional arrays of POMs using laser irradiation of thermo-optical tweezers.[1] This is a novel technique where we exploit the matching absorptivity of heptamolybdate SOMs with the wavelength of the laser (1064 nm) of optical tweezers to generate water vapour bubble via localised heating induced hot spots. This culminates in the circulation of Gibbs-Marangoni convection currents in the sample chamber (glass slide and coverslip sandwiched by SOM dispersion and adjoined by double sided tape) and finally in the deposition of SOM particles at the bottom of the glass slide. This deposition process is not mere aggregation but a phase transition phenomenon where SOM colloids are transitioning to polycrystalline POM arrays.[1] Further, these arrays have demonstrated their function as 2D catalytic chemical reactionwares, for instance, SOMs along with various POFs (Porous organic frameworks) have been shown to form inorganic-organic hybrids which on patterning act as robust catalysts for oxidation of aliphatic and aromatic aldehydes.[2] Additionally trails formed from SOMs have exhibited catalysis of epoxidation of alkenes in a site specific fashion.[3] Furthermore studies pertaining to exploring the stability regimes of SOMs and their applications in sensing, selective adhesion and photocatalysis shall be discussed.

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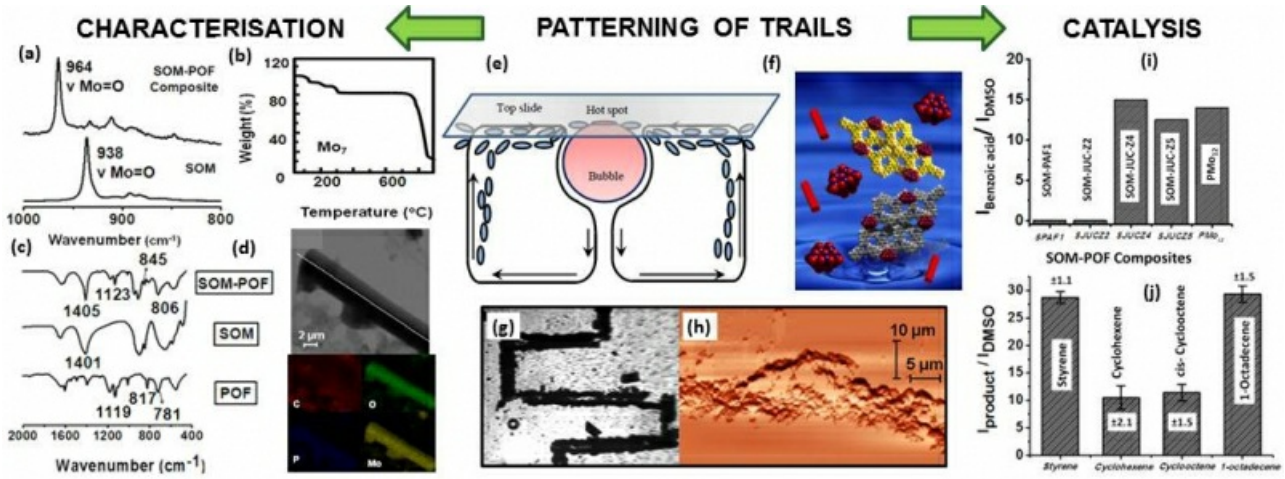

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