Thin Film Plasmonic Supercrystals as Polaritonic Materials

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Abstract: Supercrystals of gold nanoparticles (AuNP) with diameters > 20 nm exhibit interesting optical properties. The periodic arrangement of the AuNP within the supercrystals leads to new well-defined collective plasmon-polariton modes and with tailored geometries even deep strong light-matter coupling at room temperature is possible.[1] To observe and study these phenomena a precise control of supercrystal geometry is crucial. The synthesis of such quasicrystalline supercrystals with large domain sizes will be explained and discussed.[2-3] The supercrystals with a well-defined layered structure are studied with transmission electron microscopy, small-angle X-ray scattering and X-ray cross-correlation analysis.[4-5] The enhanced near-fields in the supercrystals can be utilized, for instance, for surface-enhanced spectroscopies and catalytic applications.[6-7] The tunable geometry of the supercrystals directly translates to tailored optical properties and in the future new materials and structures can be explored.

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