

# Abstract of Presentation

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## Fabrication of Self-organized Metal-Polymer Hybrid Structures for Optics and Photonics:

(WPI-AIRM, IMRAM, Tohoku University, & JST-CREST, JST-PREST)

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### Abstract :

Many attentions have been paid for novel photonics and plasmonics devices based on the metallic nano/micro structures having unique optical characteristics. The organic/inorganic hybrids, especially metal/polymer hybrids, are applied as functional materials in various fields. Combination of metallic/inorganic substances with nano/micro structured polymer materials will provide novel photonic and optical materials having high processability and flexibility.

We have reported that “honeycomb-patterned polymer films”, which have two-dimensional regular arrays of micro/nano pores, were fabricated from many kinds of polymeric substances by simple casting process of polymer solutions under humid condition. Regularly arranged condensed water droplets generated on the polymer solution surface due to evaporation cooling of the volatile solvent act as a temporal template of the “self-organized honeycomb pattern”. Electroless plating or vapor deposition of honeycomb-patterned polymer films simply provides porous metallic films<sup>1,2)</sup>. Metal pincushion structures were also prepared by simple peeling of the honeycomb-patterned polymer films<sup>1)</sup>.

The honeycomb-patterned polymer films and their metal hybrids showed unique optical properties, e.g. selective light scattering due to regularly arranged micro/nano pores<sup>3)</sup>, pore size effect on optical transparency and wettability<sup>4)</sup>. Recently we have found that silver pincushion arrays prepared by vapor deposition of the mechanically peeled honeycomb-patterned polymer films strongly enhanced Raman scattering of fluorescence dye molecules in water solution.

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