Generalized Mueller matrix Ellipsometry of 3-D spherical photonic bandgap structures

Laser Assisted Nano-Engineering Lab

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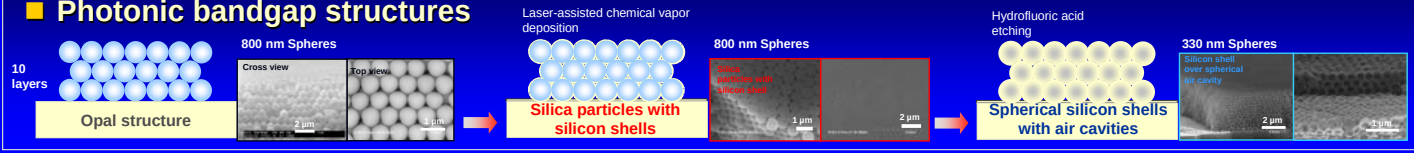
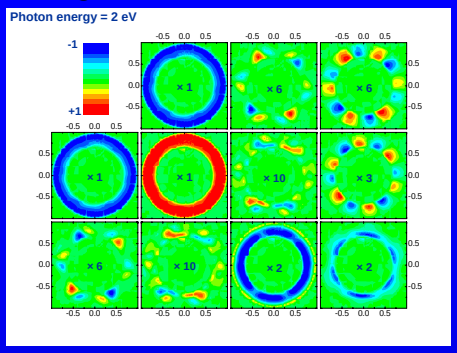
Our messages

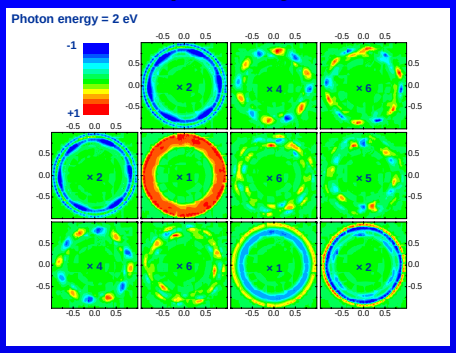
- Angle-resolved Generalized Mueller matrix Ellipsometry can inform about structural order and optical properties of nano-scale periodic photonic bandgap (PBG) structures.
- The angle-resolved images reveal strong polarization mode coupling within the photonic bandgap and provide depth resolved structural properties.

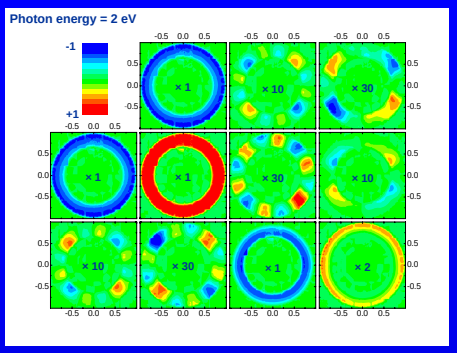
Photonic bandgap structures

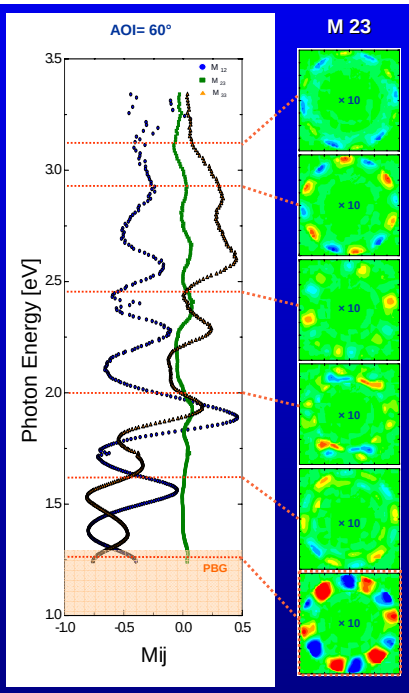


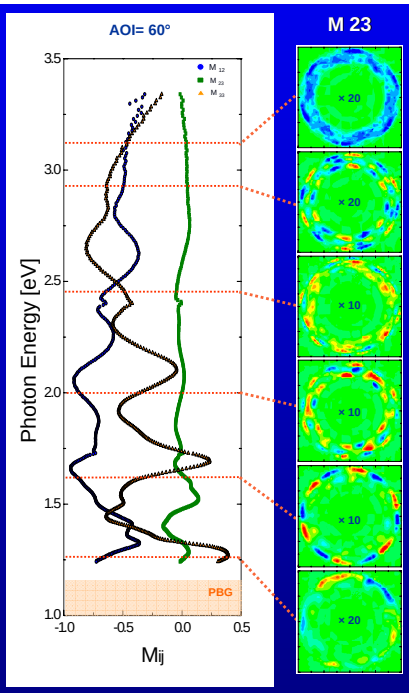
Angle-resolved Generalized Mueller matrix Ellipsometry

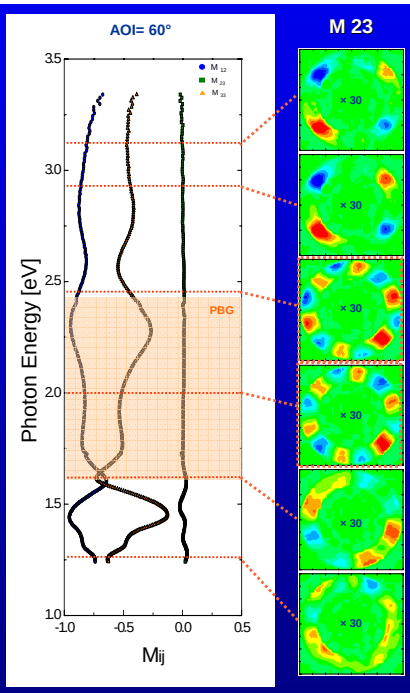












- Strong p-s mode conversion within photonic bandgap and higher oders thereof with sixfold symmetry concordant with axes of nano sphere self assembly.
- It remains unclear if structures are face centerd cubic (fcc) or hexagonal closed packed (hcp).

- First-order photonic bandgap in near infrared and out of range here, but higher orders detectable by fine-structure six-fold symmetry p-s mode conversion pattern for double-sphere photonic bandgap structures.

- Strong p-s mode conversion within photonic bandgap of hollow sphere photonic bandgap structures
- Disorder body centered cubic (bcc) domains near surface cause 4fold symmetry pattern of p-s mode conversion scattering at high photon energies.

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