Challenges and recent progresses in experimental quantification of materials optical properties

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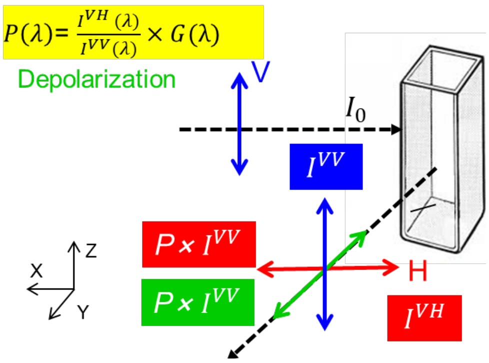
Optical spectroscopic methods that exploit light/matter interactions including absorption, scattering, and fluorescence emission have remained the most applied tools for studying the structures and properties of macromolecular, supramolecular, and nanoscale (MSN) materials. However, existing measurement techniques are inadequate to resolve the complex interplays among the materials light absorption, scattering, and fluorescence emission that can concurrently occurs in many MSN samples. As examples, UV-vis measures only the intensity attenuation of light passing through the samples but offers no insights to the origins of the signal attenuation and the photons reaching the detector. Current light scattering techniques for fluorescence MSN materials suffers from interference by both light absorption and on-resonance-fluorescence (ORF) that is inevitable in the wavelength region where the material fluorescence excitation and emission spectral overlooks. Indeed, there are numerous problematic data interpretations and analyses in literatures, including these published in leading chemical science journals. One key limitation in

Introduced in this talk several new optical spectroscopic methods we have recently developed for studying materials light absorption, scattering, and emission properties. Special emphases will be given to theory and a series of representative applications of the linearly polarized and the integrating-sphere-assisted resonance synchronous (LPRS and ISARS, respectively) spectroscopic methods.[1-4] The prospects of these LPRS and ISARS techniques for agricultural, environmental, biological, and materials research will also be discussed.



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