Polarized light methods for probing sub-wavelength scale structural anisotropy

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In this talk I shall introduce some new experimental concepts of polarimetry for probing structural anisotropy of biological tissues and other complex materials at the nanometer (sub-wavelength) length scales. Specifically, a custom designed state-of-the-art dark-field spectroscopic Mueller matrix microscopy system will be discussed, which has the ability to extract complete polarization information and to quantify the intrinsic polarimetry characteristics from even a single isolated nanoparticle / nanostructure. An illustrative example of the exceptional ability of this system will be presented, where this polarization microscopic system in combination with a suitable polarization analysis model enabled quantitative assessment and understanding of the self-healing behavior of a bio-inspired piezoelectric organic crystal by sensing changes in structural anisotropy in the nanometer length scale. A spectral Mueller matrix based inverse light scattering polarimetry method for the quantification of nanometer scale multifractal (multi-scale self-similar) anisotropy of tissue will be presented and its initial application for pre-cancer detection will be discussed.

Relevant references

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