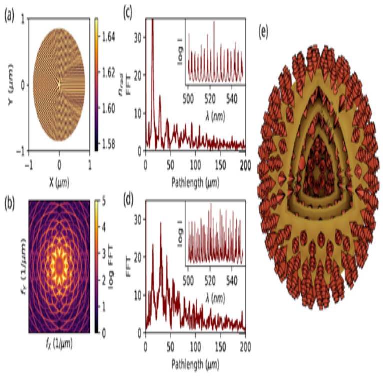

Starch: exploring the complexities of anisotropic multiresonator emission systems

Description

Starch granules offer a unique platform for studying complex, multiresonator lasing phenomena, highlighting the importance of considering structural heterogeneity. We report the observation of multiresonator lasing in anisotropic dye-doped starch granules. Utilizing a custom-designed hyperspectral imaging system with submicrometer spatial resolution achieved via raster scanning laser excitation, the authors mapped the spatial distribution of light amplification within individual starch granules. Our analysis revealed the presence of multiple lasing pathways within a single granule, directly correlated to the anisotropic refractive index resulting from the layered amylose and amylopectin structure. Furthermore, the analysis revealed the presence of multiple types of emitters with distinct differences in lasing emission properties. A model based on the granule’s blocklet architecture confirms the significant influence of the anisotropic refractive index. This work demonstrates the potential of starch granules as a unique platform for studying complex multiresonator lasing phenomena and highlights the importance of considering structural heterogeneity in random lasing systems. The findings offer new insights into bio-inspired photonic materials and advanced optical imaging techniques.

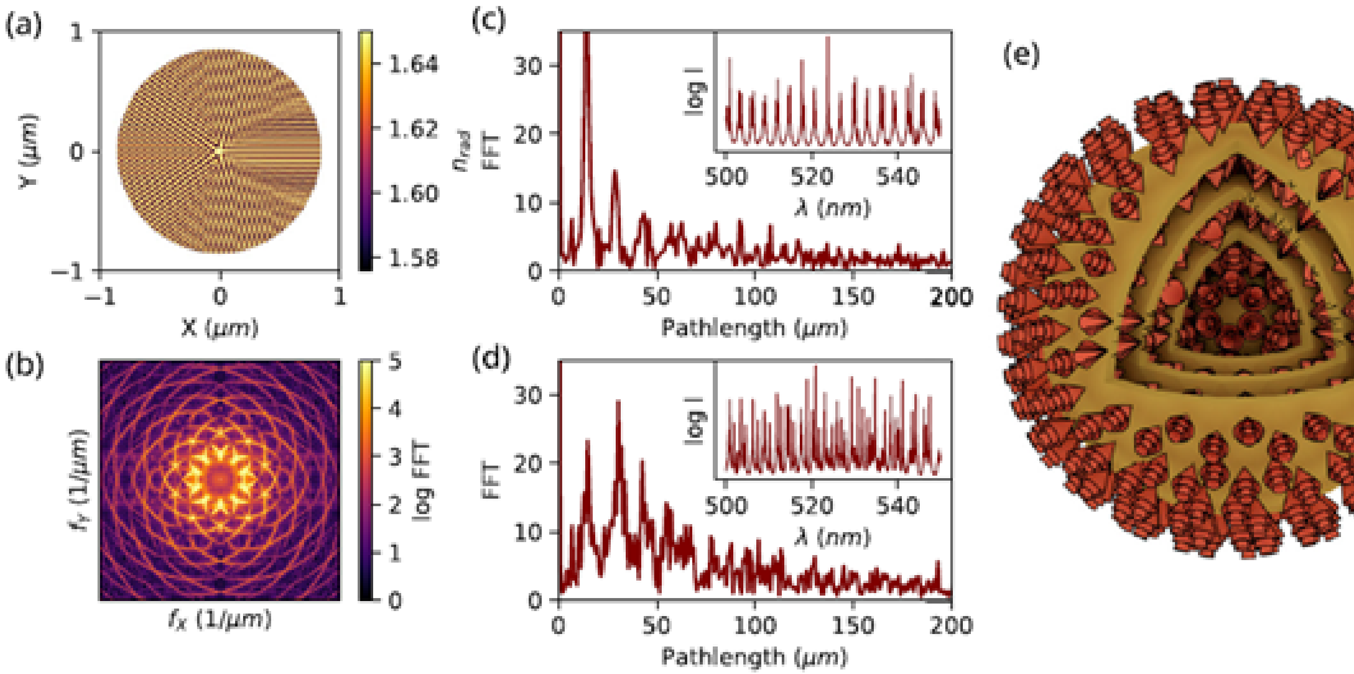

Figure (a) Spatial alignment of the radial component of the refractive index with the size of the building block *L* D200 nm and (b) the corresponding 2D FFT, confirming golden angle alignment. (c) Simulated optical path length from the resonator with refractive index radial alignment (inset), and (d) optical path length from the simulated spectrum (inset) for periodic radial alignment of RI with building block *L* D200 nm. (e) Representation of director alignment in a 3D starch granule based on the blocklet spatial model.

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