Unidirectional Light Propagation in Macroscopic Self-Assembled Gain-Loss Nanomaterials

Initiative: Freigeist-Fellowships

Bewilligung: 03.07.2017

Laufzeit: 5 Jahre

Projekt-Website: https://kingslab.de/research/

For the next generation of optical computing, a novel and cost efficient approach is needed. This future development requires both tailored control over nanometer-sized building blocks on large area and a fundamental understanding of the gain and loss mechanisms. In analogy to an electric diode, which conducts electron current in one direction, I will establish a one-way road for photons. Currently, practical demonstrations are scarce, and are limited in terms of how many devices may be fabricated in parallel. To realize fabrication on a larger scale, a synergy between optical metamaterials and colloidal self-assembly will be leveraged. This requires, on the one hand, applying concepts from optical metamaterials, which obtain their properties from their building blocks rather than from their constituent material; and, on the other hand, using pre-existing gain and loss building blocks, which form an organized structure on large area by reducing their free energy. The strategy is to use my experience in rational design, large area self-assembly of tailored building blocks and optical characterization in the unique research environment Dresden to fabricate cost-efficient, programmable and up-scalable photonic diodes. This state-of-the art and interdisciplinary study will combine elements from physics, chemistry and engineering to lead into a novel class of optical devices.

Projektbeteiligte

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Active Plasmonic Colloid-to-Film-Coupled Cavities for Tailored Light Matter Interactions
Hybridized Guided-Mode Resonances via Colloidal Plasmonic Self-Assembled Grating
Mechanotunable Surface Lattice Resonances in the Visible Optical Range by Soft Lithography Templates and Directed Self-Assembly
Tunable Circular Dichroism by Photoluminescent Moiré Gratings

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Es werden die Institutionen genannt, an denen das Vorhaben durchgeführt wurde, und nicht die aktuelle Adresse.

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