QuaDoPS
Project ID: 339905
Funded under: FP7-IDEAS-ERC

Quantum-Dot Plasmonics and Spasers

From 2014-02-01 to 2019-01-31, closed project

Project details

| Total cost: | Topic(s): |
| EUR 2 500 000 | ERC-AG-PE8 - ERC Advanced Grant - Products and process engineering |

| EU contribution: | Call for proposal: |
| EUR 2 500 000 | ERC-2013-ADG See other projects for this call |

| Coordinated in: | Funding scheme: |
| Switzerland | ERC-AG - ERC Advanced Grant |

Objective

This project will fabricate and study devices known as spasers, which are the plasmonic analog of conventional lasers. In general, plasmonic devices exploit electromagnetic waves known as surface plasmon polaritons (herein shortened to surface plasmons) that propagate at the surface of a metal. Because these waves allow light to be concentrated in nanometer-scale volumes (hot spots), they can lead to enhanced light-matter interactions. Consequently, plasmonic structures have been studied for various photonic applications. However, because surface plasmons dissipate energy in the metal, intrinsic losses can severely limit light-matter interactions and the performance of plasmonic devices. Therefore, simple routes to counteract losses by adding a gain material to rejuvenate the surface plasmons have been sought. Moreover, by adding sufficient optical gain to a plasmonic resonator, a spaser can be created. This can lead to an extremely versatile nanoscale source of surface plasmons, photons, and/or intense electromagnetic fields. Therefore, spasers can enable fundamental studies on the limits of nanoscale optics as well as various applications. Recently, the very first spasers have appeared, leading to many open questions. To help address these, the PI will perform fundamental studies on a broad class of plasmonic devices that incorporate gain. The proposed research will take advantage of his expertise in two areas: (a) highly fluorescent semiconductor nanocrystals (colloidal quantum dots) for the gain material and (b) the fabrication of high-quality low-loss patterned metallic films. By combining these, an ideal route to spasers will be pursued. The project will develop designs and fabrication processes to create quantum-dot-decorated plasmonic resonators, and then investigate their gain, amplification, and spasing behavior. Another objective is to develop new approaches to place individual quantum dots at plasmonic hot spots and study their properties.

Related information

Report Summaries

Mid-Term Report Summary - QUADOPS (Quantum-Dot Plasmonics and Spasers)
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Switzerland

EU contribution: EUR 2 500 000

Activity type: Higher or Secondary Education Establishments

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Beneficiaries

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Subjects

Construction Technology - Industrial Manufacture - Materials Technology - Physical sciences and engineering

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