École polytechnique fédérale de Lausanne (EPFL) Valais/Wallis
Institute of Chemical Sciences and Engineering (ISIC)
Basic Science Faculty (SB)
Energypolis, Rue de l'Industrie 17, CH-1950 Sion, Switzerland

SEMINAR SERIES

HIGHLIGHTS IN ENERGY RESEARCH

06.12.2018, 16:00 - 17:00, EPFL Valais, 4th floor, ZEUZIER room

Quantum-Dot Plasmonics

Prof. David J. Norris

Optical Materials Engineering Laboratory, ETH Zurich, Switzerland

Host : Prof. Raffaella Buonsanti

Quantum optics involves the coupling of quantum emitters to their electromagnetic environment. Because this coupling is related to the concentration of the optical field, it is typically constrained by the diffraction limit of light. One way to circumvent this is by moving to quantum plasmonics, which uses surface plasmon polaritons (SPPs) instead of photons. However, despite the advantages of this approach, quantum plasmonics has not yet been fully explored. It has been limited in large part by experimental difficulties in creating the necessary structures. We address this problem by combining state-of-the-art quantum emitters with plasmonic structures (waveguides and reflectors) that approach theoretical performance limits. We synthesize highly luminescent colloidal quantum dots (photoluminescence quantum yield >90%) and precisely place them on template-stripped silver wedge waveguides. We demonstrate efficient coupling of the quantum-dot emission into guided plasmonic modes in the waveguide. In addition, by adding efficient reflectors, high-Q plasmonic resonators are obtained. More generally, the flexibility and fidelity of the resulting quantum-plasmonic systems indicates that they will allow a broad set of nanoscale quantum-optical measurements to be pursued.

Prof. David J. Norris received his B.S. in Chemistry from the University of Chicago (1990). He then completed his Ph.D. at MIT (1995) under the guidance of Moungi Bawendi, working on colloidal quantum dots. After an NSF postdoctoral fellowship with W. E. Moerner at the University of California, San Diego, he started his own research group at the NEC Research Institute in Princeton (1997). He then became an Associate Professor (2001-2006) and Professor (2006-2010) of Chemical Engineering and Materials Science at the University of Minnesota. In 2010, he moved to ETH Zurich where he is currently Professor of Materials Engineering and Head of the Department of Mechanical and Process Engineering (D-MAVT). Professor Norris has received the Credit Suisse Award for Best Teacher at ETH Zurich, twice the Golden Owl Award for Best Teacher in D-MAVT, the Max Rössler Research Prize, an ERC Advanced Grant, and the *ACS Nano* Lectureship Award. He is a Fellow of the American Physical Society and the American Association for the Advancement of Science, and an editorial board member for *ACS Photonics* and *Nano Letters.* His research focuses on how materials can be engineered to create new and useful optical properties.