

Coupling of semiconductor carbon nanotubes emission with silicon photonic microring resonators

Francesco Sarti, Niccolò Caselli, Federico La China, Francesco Biccari, Ughetta Torrini, Francesca Intonti, Anna Vinattieri, Elena Duran-Valdeiglesias, Weiwei Zhang, Adrien Noury, et al.

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13:30	<p>Coupling of semiconductor carbon nanotubes emission with silicon photonic microring resonators ^</p> <p>Authors : Francesco Sarti¹, Niccolò Caselli¹, Federico La China¹, Francesco Biccari¹, Ughetta Torrini¹, Francesca Intonti¹, Anna Vinattieri¹, Elena Durán-Valdeiglesias², Weiwei Zhang², Adrien Noury², Carlos Alonso-Ramos², ThiHong Cam Hoang², Samuel Serna², Xavier Le Roux², Eric Cassan², Nicolas Izard², Hongliu Yang³, Viktor Bezugly³, Gianaurelio Cuniberti³, Arianna Filoramo⁴, Laurent Vivien² and Massimo Gurioli¹.</p> <p>Affiliations : Affiliations 1 Department of Physics and Astronomy and LENS, University of Florence, Via Sansone 1, I-50019 Sesto Fiorentino (FI), Italy 2 Inst. Elect. Fondamentale (IEF), Univ Paris Sud, CNRS UMR 8622, Université Paris-Saclay F-91405 Orsay, France 3 TechnischeUniversitaet Dresden, Institute for Materials Science, Dresden, Germany 4 CEA Saclay, IRAMIS, NIMBE (UMR 3685), LICSEN, Bat. 125, F-91191 Gif-sur-Yvette, France</p> <p>Resume : Hybrid structures are needed to fully exploit the great advantages of Si photonics and different approaches have been addressed where Si devices are bonded to different materials and nanostructures. Here we experimentally study the use of semiconductor carbon nanotubes for emission in the 1300 nm wavelength range to functionalize Si photonic structures in view of optoelectronic applications. The Si microrings are fully characterized by near field forward resonant scattering with 100 nm resolution. We show that both TE and TM modes can be addressed on the top of the microrings in a vectorial imaging of the in-plane polarization components. We coupled the Si microresonators with selected carbon nanotubes for high photoluminescence emission. Coupling of the nanotubes with the evanescent tails in air of the electric field localized in the photonic modes of the microresonators is demonstrated by sharp resonances overimposed to the nanotube emission bands. By mapping the Si and the nanotubes emission we demonstrate that strong enhancement of the nanotubes photoluminescence can be achieved both in the photonic modes of microdisks and slot microrings, whenever the spatial overlap between nanoemitters and photonic modes is fulfilled.</p>	M.P1.30	
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