

Nanowire antenna emission

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We experimentally demonstrate the directional emission of polarized light from single semiconductor nanowires. The directionality of this emission has been directly determined with Fourier micro-photoluminescence measurements of vertically oriented InP nanowires. Nanowires behave as efficient optical nanoantennas, with emission characteristics that are not only given by the material but also by their geometry and dimensions. By means of finite element simulations, we show that the radiated power can be enhanced for frequencies and diameters at which leaky modes in the structure are present. These leaky modes can be associated to Mie resonances in the cylindrical structure. The radiated power can be also inhibited at other frequencies or when the coupling of the emission to the resonances is not favored. We anticipate the relevance of these results for the development of nanowire photon sources with optimized efficiency and controlled emission by the geometry and/or the periodic arrangement of nanowires. [1, 2, 3]

[1] G.Grzela, R. Paniagua-Domínguez, T. Barten, Y. Fontana, J. A. Sánchez-Gil, J. Gómez Rivas, Nano Lett. 12, 5481 (2012)

[2] Y. Fontana, G. Grzela, E. P. A. M. Bakkers, J. Gómez Rivas, Phys. Rev. B 86, 245303 (2012)

[3] R. Paniagua-Domínguez, G.Grzela, J. Gómez Rivas, J. A. Sánchez-Gil, Nanoscale, in press (2013)