Directional light emission from arrays of semiconductor nanowires mapped by Fourier microscopy

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Controlling the dispersion and directionality of the emission of nanosources is one of the major goals of nanophotonics research. We couple InP nanowire (NW) light emission to Bloch modes of periodic NW structures. Arrays of bottom-up grown semiconductor nanowires can form a 2D photonic crystal [1]. Here, we present the first measurements of light emission from nanowire photonic crystals by using Fourier microscopy. With this technique we efficiently collect the directional emission of the coupled NW array within the numerical aperture of a microscope objective. We show that the directional emission of the nanowire arrays strongly depends on the nanowire diameter and the periodicity of the NW array, as shown in Figure 1. We also demonstrate that the directionality of the emission can be easily controlled by infiltrating the photonic crystal with a high refractive index liquid [2]. This work opens new possibilities for the control of the emission of nanosources that could lead to development of novel light emitting devices.

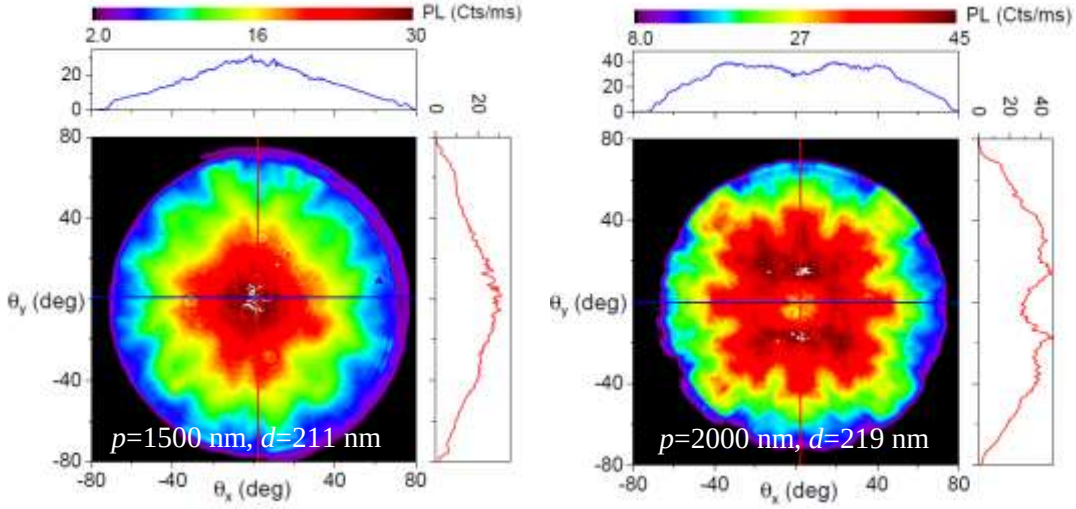

Figure 1: Variation in the directional photoluminescence (PL) patterns of two different NW arrays. Periodicity (*p*) and NW diameter (*d*) of the NW array are given in each image. The graphs at the top and right sides of the images display profiles of the images along the horizontal and vertical axis.

[1] S. L. Diedenhofen, O. T. A. Janssen, M. Hocevar, A. Pierret, E. P. A. M. Bakkers, H. P. Urbach, J. Gómez Rivas, ACS Nano **5**, 5830 (2011)
[2] Y. Fontana, G.Grzela, E. P. A. M. Bakkers, J. Gómez Rivas, Phys. Rev. B **86**, 245303 (2012)