A three-dimensional silicon photonic crystal nanocavity with enhanced emission from embedded germanium islands

Tue, 2013-11-19 00:40 - Lukas Hanschke [1] **Date:** 2012-08-29
Author(s):
N. Hauke, A. Tandaechanurat, T. Zabel, T. Reichert, H. Takagi, M. Kaniber, S. Iwamoto, D. Bougeard, J. J. Finley, G. Abstreiter, and Y. Arakawa

Reference:
New J. Phys. 14 083035 (2012)

URL:
http://iopscience.iop.org/1367-2630/14/8/083035/ [2]

We report the realization of a silicon three-dimensional photonic crystal nanocavity containing self-assembled germanium-island emitters. The three-dimensional woodpile photonic crystal was assembled layer by layer by micromanipulation using silicon plates grown by molecular beam epitaxy. An optical nanocavity was formed in the center of the photonic crystal by introducing a point defect into one of the plates. Measurements of the filtered spontaneous emission from the Ge islands in the active plate through the localized modes of the structure directly reveal information on the evolution of the frequency and Q-factor as upper cladding plates are sequentially added. An exponential increase of the cavity-Q is observed when the number of upper cladding plates is increased up to a maximum of ten. The emission of germanium-islands within the cavity reveals several strongly polarized cavity modes with quality-factors up to ≈13 600. The emission intensity of the cavity modes is enhanced by large factors up to ≈58× as compared with the active plate outside the photonic environment.

- 00. QUANTUM INFORMATION SCIENCE [3]
- SOLID [4]

Links:
[1] http://qurope.eu/users/lhanschke
[2] http://iopscience.iop.org/1367-2630/14/8/083035/
[3] http://qurope.eu/category/qics/00-quantum-information-science
[4] http://qurope.eu/category/projects/ips/solid