

2018 TIGP: Advanced Nanotechnology (A)

Midterm Report

Due: 5PM on May 2, 2018

Please select **“one”** or **“several”** papers from the paper list related to the development and technology of photonic crystals and metamaterials, and write a report with about 1000 words for the midterm of this lecture.

Warning: No Plagiarism

You have to write your reports based on your own understanding and wording. People who are caught plagiarizing the contexts of references papers would be given no points.

Paper List:

- (1) Painter O, Lee R K, Scherer A, Yariv A, O'Brien J D, Dapkus P D and Kim I ,
“Two-dimensional photonic band-gap defect mode laser”, Science 284 1819–21(1999)
- (2) Akahane Y, Asano T, Song B S and Noda S, “High-Q photonic nanocavity in a two-dimensional photonic crystal”, Nature 425 944–7(2003)
- (3) H. G. Park, S. H. Kim, S. H. Kwon, Y. G. Ju, J. K. Yang, J. H. Baek, S. B. Kim, and Y. H. Lee, “Electrically driven single-cell photonic crystal laser,” Science, 305, 1444–1447 (2005).
- (4) Bryan Ellis, Marie Mayer, Gary Shambat, Tomas Sarmiento, Eugene Haller, James S. Harris, and Jelena Vuckovic, “Ultralow-threshold electrically pumped quantum-dot photonic-crystal nanocavity laser”, Nature Photonics, 5, 297-300 (2011).
- (5) K. Hirose, Y. Liang, Y. Kurosaka, A. Watanabe, T. Sugiyama and S. Noda, “Watt-class high-power, high-beam-quality photonic-crystal lasers”, Nature Photonics 8, 406–411 (2014)
- (6) R. A. Shelby, D. R. Smith, and S. Schultz, “Experimental verification of a negative index of refraction,” Science, 292, 77 (2001).
- (7) N. Fang, H. Lee, C. Sun, and X. Zhang, “Sub-diffraction-limited optical imaging with a silver superlens,” Science 308, 534 (2005); Z. Liu, H. Lee, Y. Xiong, C. Sun, and X. Zhang, “Far-field optical hyperlens magnifying sub-diffraction-limited objects,” Science, 315, 1686 (2007).
- (8) J. B. Pendry, D. Schurig, and D. R. Smith, “Controlling electromagnetic fields,” Science, 312, 5781, 1780 (2006).
- (9) M. T. Hill et al, “Lasing in metallic-coated nanocavities,” Nature Photonics, 1, 589 (2007).
- (10) M. Khorasaninejad, W. T. Chen, R. C. Devlin, J. Oh,, A. Y. Zhu, and F. Capasso,

“Metalenses at visible wavelengths: diffraction-limited focusing and subwavelength resolution imaging,” Science 352, 1190 (2016).

Turn in your Reports:

If you write your report based on papers (1) to (5), e-mail your reports to Dr. Min-Hsiung Shih (mhshih@gate.sinica.edu.tw). For those who work on papers (6) to (10), e-mail your reports to Dr. Shu-Wei Chang (swchang@sinica.edu.tw). If you reference papers from both categories, e-mail your reports to both of us.