

Manipulating the Polarization of Electromagnetic Waves via Metastructures

Ruwen Peng*, and Mu Wang

National Laboratory of Solid State Microstructures, School of Physics, and Collaborative Innovation Center of Advanced Microstructures, Nanjing University, Nanjing 210093, China

*corresponding author, E-mail: rwpeng@nju.edu.cn

Abstract

In this work, we present our recent work on manipulating the polarization of electromagnetic waves with metastructures. We start from how to tune the polarization of electromagnetic waves via time retardation with a microstructured surface, and then to control them based on a dispersion-free metastructure. Further, we show a freely tunable polarization rotator for broadband terahertz waves by using a metastructure, and also an example on dynamically switching the polarization of the infrared light based on the phase transition of vanadium dioxide. The investigations provide some guidelines to control the polarization of electromagnetic waves at subwavelength scale.

References

- [1] J. B. Pendry, A. J. Holden, D. J. Robbins, W. J. Stewart, *IEEE Trans. Microwave Theory Tech.* 1999, 47, 2075.
- [2] Y. Liu, X. Zhang, *Chem. Soc. Rev.* 2011, 40, 2494.
- [3] N. Yu, P. Genevet, M. A. Kats, F. Aieta, J.-P. Tetienne, F. Capasso, Z. Gaburro, *Science* 2011, 334, 333.
- [4] S. C. Jiang, X. Xiong, P. Sarriugarte, S. W. Jiang, X. B. Yin, Y. Wang, R. W. Peng, D. Wu, R. Hillenbrand, X. Zhang, and Mu Wang, *Phys. Rev. B* 2013, 88, 161104(R).
- [5] S. C. Jiang, X. Xiong, Y. S. Hu, Y. H. Hu, G. B. Ma, R. W. Peng, C. Sun, and Mu Wang, *Phys. Rev. X* 2014, 4, 021026.
- [6] R. H. Fan, Y. Zhou, X. P. Ren, R. W. Peng, S. C. Jiang, D. H. Xu, X. Xiong, X. R. Huang, and Mu Wang, *Advanced Materials* 2015, 27, 1201.
- [7] Zhi-Yong Jia, Fang-Zhou Shu, Ya-Jun Gao, Feng Cheng, Ru-Wen Peng, Ren-Hao Fan, Yongmin Liu, and Mu Wang, *Phys. Rev. Applied* 2018, 9, 034009.
- [8] R. Fan, B. Xiong, Ru-Wen Peng, and Mu Wang, *Advanced Materials* 2019, 201904646, DOI: 10.1002/adma.201904646.