[18p-211B-1~13]4.1 Plasmonics and Nanophotonics

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▲[18p-211B-5][INVITED] Photonic Topological Insulator and Novel Electromagnetic Properties

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To harness at will propagation of electromagnetic (EM) waves is important for valuable applications. As a new approach, topology fostered in condensed matter physics [1] has been introduced to EM systems. We have revealed [2] that deforming honeycomb lattice of dielectric cylinders with C_{6v} symmetry preserved generates a topological EM state. It is found that a pseudospin degree of freedom emerges in the EM modes associated with the orbital angular momentum, which, upon a topological phase transition at the neat honeycomb structure, renders helical edge states similar to that of quantum spin Hall effect in electronic systems. Our theory has been confirmed in microwave experiments based on a photonic crystal of alumina cylinders where interface EM transportations with topological protection were observed [3]. This method can be applied for various plasomonic and nanophotonic systems, and cover the whole frequency band up to visible lights. Recent progresses and perspectives of the present approach will also be discussed. References:[1] H.-M. Weng, R. Yu, X. Hu, X. Dai and Z. Fang: Adv. Phys. vol. 64, 227 (2015); [2] L.-H. Wu and X. Hu: Phys. Rev. Lett. vol. 114, 223901 (2015); [3] Y.-T. Yang, J.-H. Jiang, X. Hu and Z.-H. Hang: Phys. Rev. Lett. vol. 120, 217401 (2018).