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The Existence of Topological Edge States in Honeycomb Plasmonic Lattices LI WANG, Hong Kong University of Science and Technology — In this paper, we investigate the band properties of 2D honeycomb plasmonic lattices consisting of metallic nanoparticles. By means of the coupled dipole method and quasi-static approximation, we theoretically analyze the band structures stemming from near-field interaction of localized surface plasmon polaritons for both the infinite lattice and ribbons. Naturally, the interaction of point dipoles decouples into independent out-of-plane and in-plane polarizations. For the out-of-plane modes, both the bulk spectrum and the range of the momentum $k_{\|}$ where edge states exist in ribbons are similar to the electronic bands in graphene. Nevertheless, the in-plane polarized modes show significant differences, which do not only possess additional non-flat edge states in ribbons, but also have different distributions of the flat edge states in reciprocal space. For in-plane polarized modes, we derived the bulk-edge correspondence, namely, the relation between the number of flat edge states at a fixed $k_{\|}$, Zak phases of the bulk bands and the winding number associated with the bulk hamiltonian, and verified it through four typical ribbon boundaries, i.e. zigzag, bearded zigzag, armchair, and bearded armchair. Our approach gives a new topological understanding of edge states in such plasmonic systems, and may also apply to other 2D vector wave systems.

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