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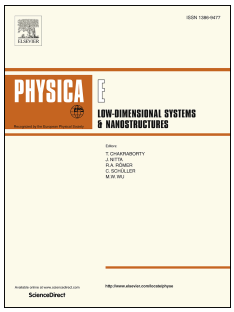

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Bozhi Jiang, Cheng Sun

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On the plasmonic properties of a symmetry-breaking silver nanoring structure

Bozhi Jiang, Cheng Sun*[1, a)]

College of Physical Science and Technology, Dalian University, Dalian, 116622, China

This work reports on a study regarding the plasmonic properties of a symmetry-breaking silver nanoring structure, in the wavelength range of 0.6 - 4.5 μm. A broken silver ring with a certain angle, as well as a full ring composed of silver and other metallic/dielectric materials, are proposed. The extinction efficiencies of the nanostructure are numerically calculated with several parameters being varied, including the broken angle, the inner and outer radii, and the thickness of the broken ring, as well as the material in the composite full ring. Multiple plasmonic resonances are observed in the extinction efficiency curves, which are attributed to the quadrupolar, octupolar, and hexadecapolar resonance modes that are revealed by the electric field distributions. The results demonstrate that the high-order modes can be altered, by varying the value of the broken angle of the ring. It is also illustrated that the resonance wavelength and the full width at half maximum of certain high-order plasmonic resonance peaks can be tuned in the wavelength range studied, by adjusting the values of the geometrical parameters of the nanoring. The plasmonic characteristics of the symmetry-breaking nanoring structure revealed in this study, provide a great platform for the designs of plasmonic devices utilizing the high-order plasmonic resonances. Besides, it is also proposed a scheme to switch the device between the multi-wavelength and single-wavelength modes.

Keywords: Plasmonic resonance; Symmetry breaking; Silver nanoring; Extinction efficiency

[a)]suncheng@dlu.edu.cn