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Second harmonic generation in three-dimensional metamaterials based on homogeneous centrosymmetric spheres JINYING XU, Beijing Computational Science Research Center — The theory of second harmonic generation in three-dimensional metamaterials consisting of arbitrary distributions of spheres made of centrosymmetric materials is developed by means of the multiple scattering method. The electromagnetic field at both the fundamental frequency and second harmonic, as well as the scattering cross section, are calculated in a series of particular cases such as a single metallic sphere, two metallic spheres, chains of metallic spheres, and other periodic distributions of the metallic spheres. It is shown that the linear and nonlinear optical response of all ensembles of metallic spheres is strongly influenced by the excitation of surface plasmon-polariton resonances. The physical origin for such a phenomenon has also been analyzed. A new class of SHG devices made of such materials is anticipated.

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