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Application of metasurface description for multilayered metamaterials and an alternative theory for metamaterial perfect absorber[1] JIANGFENG ZHOU, University of South Florida, HOU-TONG CHEN, Los Alamos National Laboratory, THOMAS KOSCHNY, Ames Laboratory, Iowa State University, ABUL AZAD, ANTOINETTE TAYLOR, Los Alamos National Laboratory, COSTAS SOUKOULIS, Ames Laboratory, Iowa State University, JOHN O'HARA, Oklahoma State University — Recently, the metamaterial perfect absorber has attracted intense interest in metamaterial community. The impedance matching mechanism based on effective bulk permittivity and permeability is widely used to explain such structures. However, this model has difficulties, in particular, because such systems are usually asymmetric, assigning homogenous effective material parameters to these systems may lead to unphysical results. In our work, we use an effective medium model that treats each layer of the metamaterial as a metasurface with unique effective surface electric and magnetic susceptibility, χ_{se} and χ_{sm} . We then use a transfer matrix method to analyze the overall EM properties of multilayered metamaterials using the effective material parameters (surface susceptibilities) of each layer. We find that the functional mechanism is the Fabry-Perot interference resulting from the multiple reflections in the cavity bounded by two metamaterial layers. This contrasts with previous explanations based on bulk effective medium theory.

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