**Radiative Properties of Periodic Micro/Nanostructures for Arbitrary Polarization**

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Periodic nano/microstructures of varies shapes are commonly used in metamaterial design to manipulate light propagation. Due to the interference effect, the radiative properties (e.g., reflectance and transmittance) of an arbitrary linearly polarized wave cannot be fully described by the corresponding radiative properties of transverse electric and transverse magnetic waves. In this work, explicit mathematical relationship between the Fresnel's coefficients and the reflectance (or transmittance) for a given polarization angle is derived for anisotropic metamaterials. A three-polarization-angle method is proposed to obtain the reflectance or transmittance for any polarization angle using the reflectance or transmittance of transverse electric (TE), transverse magnetic (TM), and another polarization status. The results are compared with rigorous electromagnetic wave simulations using the finite-difference time-domain (FDTD) method. Polarization-independent reflectance of metamaterials made of regular polygons is also demonstrated. The radiative properties obtained from the three-polarization-angle method are in agreement with those from the rigorous numerical simulation. This work may facilitate the investigation of eigen polarizations in metamaterials for polarization control.