Equivalent conductivity method: straightforward analytical solution for metasurface-based structures

We present an equivalent conductivity method for analyzing metasurface-based structures, which relies on the derivation of equivalent conductivity containing the properties such as the geometry, periodicity, and the surrounding materials. Using this approach, one can calculate the equivalent conductivity for a single metasurface layer and then consider it in further analysis of multilayer structures. Description of this method is made by considering an array of graphene nanodisks as a metasurface. The equivalent conductivity is achieved with the aid of the polarizability of a graphene nanodisk. This method is further applied to design graphene-based mid-infrared absorbers, and the results obtained by the equivalent conductivity method are confirmed by full-wave simulations.