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标题: A comparison of graphene, superconductors and metals as conductors for metamaterials and plasmonics
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摘要: Recent advancements in metamaterials and plasmonics have promised a number of exciting applications, in particular at terahertz and optical frequencies. Unfortunately, the noble metals used in these photonic structures are not particularly good conductors at high frequencies, resulting in significant dissipative loss. Here, we address the question of what is a good conductor for metamaterials and plasmonics. For resonant metamaterials, we develop a figure-of-merit for conductors that allows for a straightforward classification of conducting materials according to the resulting dissipative loss in the metamaterial. Application of our method predicts that graphene and high-T-c superconductors are not viable alternatives for metals in metamaterials. We also provide an overview of a number of transition metals, alkali metals and transparent conducting oxides. For plasmonic systems, we predict that graphene and high-T-c superconductors cannot outperform gold as a platform for surface plasmon polaritons, because graphene has a smaller propagation length-to-wavelength ratio.
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