NEAR-FIELD COUPLING OF A NANOSTRUCTURED METAMATERIAL WITH A GRAPHENE-COVERED PLATE

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ABSTRACT. Coupled surface plasmon/phonon polaritons and hyperbolic modes are known to enhance radiative transport across nanometer vacuum gaps but usually require identical materials. It becomes crucial to achieve strong near-field energy transfer between dissimilar materials for applications like near-field thermophotovoltaic and thermal rectification. In this work, we theoretically demonstrate extraordinary near-field radiative transport between a nanostructured metamaterial emitter and a graphene-covered planar receiver. The results show that by carefully selecting the graphene chemical potential, the total near-field radiative heat flux can be greatly enhanced. The physical mechanism is elucidated by the near-field surface plasmon coupling with fluctuational electrodynamics and dispersion relations.