ANALYSIS OF NEAR-FIELD EMISSION WITHIN NANO-GAPS USING FINITE DIFFERENCE TIME DOMAIN METHOD

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ABSTRACT. Enhancement of near-field radiative emission via coupling of surface plasmons in nano-gaps formed between thin films is quite important for energy harvesting using nano-thermophotovoltaic cells. Design and construction of such cells need to be carried out along with detailed modeling studies, necessitating accurate calculation of near-field emission within thin films. Our objective in this paper is to provide a methodology based on finite difference time domain analysis for the calculation of the near-field thermal radiation emission based on local density of electromagnetic states. Near-field thermal emission is investigated within the nano-gap formed between thin silicon carbide layers where both support surface phonon polaritons. Modeling this problem with the finite difference time domain method is not trivial particularly for establishing the Drude-Lorentz permittivity model. Here, we discuss the challenges and the possible solutions to overcome these difficulties.