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Simulation study of nanostructured copper photocathodes

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In this research, we present a detailed electromagnetic characterization and optimization study of nanostructured photocathodes for electron gun applications. The study concentrates on photocathodes operated at visible to infrared wavelengths, for which an accurate simulation model is constructed. For this, we apply a customized dispersion model for the cathode material, which can describe the measured permittivity data over a broad frequency range. Various geometries for nanopatterns are explored in order to understand how different geometric parameters affect cathode reflectivity. The results reveal an optimized model of nanostructured photocathodes, demonstrating improved absorptance at the target laser wavelength. Additionally, the impact of geometrical uncertainties on the reflectance spectra is examined.

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