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Controlled Ag Nanopattern Formation through UV Wavelength Dependent Photochemical Interactions on PPLN[1] YANG SUN, ROBERT NEMANICH, Department of Physcis, Arizona State University — This study establishes that ferroelectric nanolithography is dependent on the excitation wavelength and that the process can be controlled through optimization of the wavelength dependent photochemical surface interactions. Periodically poled lithium niobate (PPLN) is used as a template for "nanolithography" of metallic nanoparticles and nanowires through a photochemical process. Prior research has established that above band gap UV emission is necessary to initiate the deposition process. Depending on the nature of the surface screening, the deposition will occur predominantly on the positive domains (internal screening) or at the domain boundaries (external screening). This research employs PPLN, which exhibits external screening, and it is shown that the location and rate of Ag nanostructure deposition is dependent on the wavelength of the UV excitation. The selective deposition is explained by a combined theory of band-bending, the mechanism of polarization surface charge screening, and the absorption depth of the UV light. As an application example, the Ag nanopatterns are employed for spatially specific surface enhanced Raman spectroscopy (SERS).

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