Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Effects of Surface Modification on Photo-Induced Ferroelectric Nanolithography[1] YANG SUN, CHI XU, CHIYU ZHU, ROBERT NEMANICH, Arizona State University — This study focuses on the photo-induced deposition of silver on polarity patterned ferroelectric surfaces. The results establish that ferroelectric nanolithography is dependent on the excitation wavelength and that surface modification can affect the process. Depending on the nature of the surface screening, the deposition occurs predominantly on positive domains (internal screening) or at domain boundaries (external screening). In this experimental study periodically poled lithium niobate (PPLN) is used as a template for "nanolithography" of metallic nanoparticles and nanowires through a photochemical process. It is shown that the location and rate of Ag nanostructure deposition is dependent on the UV excitation wavelength. Selective deposition is explained by considerations of band-bending, the mechanism of polarization surface charge screening, and the absorption depth of the UV light. In exploring the effects of surface modification, a nm-thick titanium oxide layer is grown on the PPLN surface by molecular beam deposition and the photo-induced Ag deposition process is repeated. It is found that Ag reduction is more selective to the domain boundaries and the positive domains. The results are analyzed in terms of our understanding of the photo-induced process.

[1]Research supported by NSF grant DMR -0805353.

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Date submitted: 29 Nov 2008 Electronic form version 1.4