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Photo-induced Nanopattern Formation on Polarity Patterned Lithium Niobate with ZnO-Modified Surfaces[1] MANPUNEET KAUR, XINGYE WANG, BRIANNA ELLER, ROBERT NEMANICH, Arizona State University — This research is focused on modifying the surface of polarity patterned lithium niobate (PPLN) templates with ultra thin layers of ZnO. Photo-induced nanopattern formation is employed to discern the effects of thin ZnO on PPLN. The spontaneous polarization of ZnO is intended to be used to enhance the photo-induced transport of electrons to the surface to reduce Ag+ to Ag nanoparticles. The ZnO thin films were deposited by plasma enhanced atomic layer deposition (PEALD) at 150 C with 0.2 nm/cycle. Photo-induced Ag nanopatterns were deposited on bare PPLN and 1, 2, 3 and 10 nm ZnO-PPLN heterostructures, immersed on an aqueous AgNO3 solution and illumination with 254 nm UV light. The photo-induced deposition of 1nm ZnO/PPLN results in enhanced Ag nanoparticle formation at domain boundaries. The positive domain selectivity is not observed on 2nm ZnO/PPLN templates, and the deposition becomes the same on both domains. The nanoparticle patterns were not evident for ZnO films thicker than 3nm. The amorphous structure of thick ZnO on PPLN tends to reduce the effect of the ZnO polarization. The effect of polarity patterned thin PEALD ZnO films is discussed to understand photo-induced electron transfer and AgNO3 reduction on ZnO-PPLN heterostructures.

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