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Fabrication and Direct Comparison of Periodically-Poled Materials for Mid-Ir Generation ERIC VERSHURE — This work presents a comparison between nonlinear crystals used for frequency conversion, including congruent lithium niobate, stoichiometric lithium niobate, and stoichiometric lithium tantalate. Periodically-poled materials were fabricated using a refined process that allowed us to efficiently electric-field pole stoichiometric samples as thick as 2.0 mm. Comparisons between the different materials were made by viewing the poled domains after etching as well as by measuring the wavelength, bandwidth, threshold, and slope efficiency created via optical parametric generation (OPG). The OPG process generated wavelengths ranging from 1.3 to 1.7 microns in the signal and 2.6 to 5.0 microns in the idler when pumped with 1.064 microns. Material absorption hindered idler wavelength generation beyond 5 microns. Bandwidths and slope efficiencies were similar for the three materials, and effective thresholds were proportional to the inverse-square of the effective nonlinear coefficient. A further measurement of poling quality was made by probing the efficiency as a function of depth in 2.0-mm thick samples. This measurement indicated that poling quality near the original "+z" surface of the crystals, where domain reversal begins during poling, was significantly better than that near the "-z" surfaces. Based on ease-of-fabrication and ability to generate long wavelengths, we recommend periodically-poled stoichiometric lithium niobate for applications in mid-IR frequency conversion.

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