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Performance and limits of micro-structured targets at high laser intensities for superior sources of light and heavy ions.[1] M. BAILLY-GRANDVAUX, J. STREHLOW, D. KAWHAITO, B. EDGHILL, C. MCGUFFEY, UCSD, M.S. WEI, LLE, N. ALEXANDER, A. HAID, GA, C. BRABETZ, V. BAGNOUD, GSI, Germany, R. HOLLINGER, A. MOREAU, S. WANG, Y. WANG, J.J ROCCA, CSU, F.N. BEG, UCSD — The generation of high-intensity ion beams driven by short pulse lasers has emerged as an important area of plasma research due to their unique short duration ($\sim$ ps) and small source size ($\sim \mu$m). In response to the demand for higher laser-to-ion conversion efficiencies, there has been growing interest in using structured targets. They have demonstrated enhanced number and energy of accelerated electrons and protons compared to flat foils. Yet, the previous experimental work on structured targets used moderate laser intensities ($< 10^{20}$ W/cm^2). We will present results of light and heavy ion acceleration from experimental campaigns at the PHELIX laser (150 J, 0.5 ps, 10^{21} W/cm^2), Germany, and at the ALEPH laser (10 J, 45 fs, 10^{21} W/cm^2), Colorado State University, using micro-pillars and micro-tubes structured foils. We will also present particle-in-cell simulations for these experiments and insights about our future experimental studies at laser intensities of $\sim 10^{22}$ W/cm^2.

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