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Optimized ion acceleration using high repetition rate, variable thickness liquid crystal targets[1] PATRICK POOLE, CHRISTOPHER WILLIS, GINEVRA COCHRAN, C. DAVID ANDERECK, DOUGLASS SCHUMACHER, The Ohio State University — Laser-based ion acceleration is a widely studied plasma physics topic for its applications to secondary radiation sources, advanced imaging, and cancer therapy. Recent work has centered on investigating new acceleration mechanisms that promise improved ion energy and spectrum. While the physics of these mechanisms is not yet fully understood, it has been observed to dominate for certain ranges of target thickness, where the optimum thickness depends on laser conditions including energy, pulse width, and contrast. The study of these phenomena is uniquely facilitated by the use of variable-thickness liquid crystal films, first introduced in P. L. Poole *et al.* *PoP* **21**, 063109 (2014). Control of the formation parameters of these freely suspended films such as volume, temperature, and draw speed allows on-demand thickness variability between 10 nanometers and several 10s of microns, fully encompassing the currently studied thickness regimes with a single target material. The low vapor pressure of liquid crystal enables in-situ film formation and unlimited vacuum use of these targets. Details on the selection and optimization of ion acceleration mechanism with target thickness will be presented, including recent experiments on the Scarlet laser facility and others.

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