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Ultrafast Laser Dewetting of Thin Metal Films

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Achieving functional devices that utilize nanostructures requires an understanding of the synthesis and assembly routes employed during their processing. Future prospects for nanomaterials synthesis will likely require the union of top-down and bottom-up self-assembly techniques, and much research has been conducted on continuous thin polymer [1] and metal [2] films. More recently, nanoparticle arrays were produced by directed self-assembly using pulsed laser induced dewetting (PLiD) of patterned metal thin films [3,4]. Here, time-resolved imaging and diffraction using the dynamic transmission electron microscope (DTEM) [5] enabled studies of PLiD of continuous thin Ni films at timescales consistent with the nanosecond liquid lifetimes of the laser-induced melting.

The observed mechanisms of PLiD were consistent with prior studies of thin metal films [2], and the liquid lifetime, monitored using nanosecond diffraction in the DTEM, agreed with calculations [3] of the liquid lifetimes during dewetting of thin Ni films. Further studies will focus on ultrafast characterization of the dewetting of patterned films with the goal of enhanced spatial control of resultant nanostructures.

References

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