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Control of eutectic solidification microstructures through laser spot perturbations SILVERE AKAMATSU, CNRS, KYUYONG LEE, Ames Laboratory, WOLFGANG LOSERT, UMD — We report on a new experimental technique for controlling lamellar eutectic microstructures and testing their stability in directional solidification (solidification at fixed rate V in a uniaxial temperature gradient) in thin sample of a model transparent alloy. A eutectic binary alloy solidifies into a mixture of two crystal phases. In stationary regimes, periodic front patterns made of an alternate stacking of lamellae of the two solid phases are observed. We observe the solidification front in real time by optical microscopy. We use micromanipulation with laser spot arrays for perturbing the solidification front on a scale ranging from one to ten times the average value of the lamellar spacing (spatial period), i.e., typically 10 to 100 microns. These perturbations arise from local heating due to the absorption of the laser light by the liquid slightly ahead of the front. We use the laser spot perturbation technique as a tool for mapping out the large range of accessible lamellar spacings at given V and for creating desired patterns (smooth spatial modulation, tilt domains).

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