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Scalable patterning using laser-induced shock waves SAIDJAFARZODA ILHOM, KHOMIDKHODZHA KHOLIKOV, Western Kentucky University, PEIZHEN LI, University of Kentucky, CLAIRE OTTMAN, DYLAN SANFORD, ZACHARY THOMAS, Western Kentucky University, OMER SAN, Oklahoma State University, HALUK E. KARACA, University of Kentucky, ALI OGUZ ER, Western Kentucky University, PEIZHEN LI, HALUK E. KARACA. COLLABORATION, OMER SAN COLLABORATION — An advanced direct imprinting method with low cost, quick, and minimal environmental impact to create thermally controllable surface pattern using the laser pulses is reported. Patterned micro indents were generated on $Ni_{50}Ti_{50}$ shape memory alloys (SMA) and aluminum using an Nd:YAG laser operating at 1064 nm combined with suitable transparent overlay, a sacrificial layer of graphite, and copper grid. Laser pulses at different energy densities which generate pressure pulses up to a few GPa on the surface was focused through the confinement medium, ablating the copper grid to create plasma and transferring the grid pattern onto the surface. Scanning electron microscope (SEM) and optical microscope images show that various patterns were obtained on the surface with high fidelity. Optical profile analysis indicates that the depth of the patterned sample initially increase with the laser energy and later levels off. Our simulations of laser irradiation process also confirm that high temperature and high pressure could be generated when laser energy of 2 J/cm^2 is used.

Saidjafarzoda Ilhom
Western Kentucky University

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