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Enhanced Laser Shock and Ablation by Active Liquid Confinements

A new method for Laser Shock Peening utilizes a liquid confinement barrier to significantly improve material properties, increasing efficiency on aluminum alloys by 150% and ablation rate on zinc by 300%.

Laser Shock Peening (LSP) is a process used to work the surface of a metal to improve its material properties. The surface of the metal is confined by a glass or liquid barrier and then exposed to short pulses from a laser. The pulse creates a shock wave that travels into the metal to cool work the surface, improving the crystalline structure. The confining barrier directs the shock wave into the metal to enhance the effects of the process, but may limit its usefulness. Glass barriers are brittle and not practical for three-dimensional surfaces, and liquid barriers are limited by the laser intensity at which they break down.

Researchers at Purdue University have developed a new method for generating a laser shock that still uses a liquid confinement barrier, but is more efficient and able to generate higher pressure. Using this method, the efficiency of LSP on aluminum alloy 6061 improved by 150 percent and the ablation rate of zinc increased by 300 percent.

Advantages:

-Liquid confinement can take any shape

-Significantly improves efficiency of laser shock peening

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Intellectual Property:

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Authors
Gary J Cheng
Yiliang Liao

Further information
Parag Vasekar
psvasekar@prf.org

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