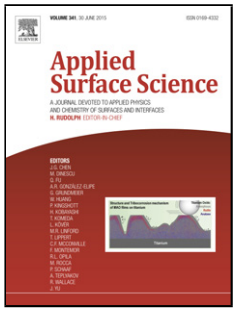

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Fabricating micro embossments on the metal surface through spatially modulating laser-induced shock wave

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ABSTRACT

In this paper, we propose one improved method to fabricate micro embossments on the metal surface through laser shock processing. One mapping layer with holes must be actively designed and produced on the metal surface, with which, laser-induced shock wave will be spatially modulated. Laser shock experiments were conducted. Then the surface morphologies, and metallographic microstructures were characterized. The forming process of the micro embossments was simulated with ABAQUS. The results show that under the spatially-modulated shock loading, the surface material flows from the high-pressure zone to the low-pressure zone, which is responsible for forming the micro embossments. The shapes, sizes and arrangements of the micro embossments conform to those of the mapping holes. The hardnesses on the entire laser-shocked zones improve remarkably due to the plastic deformation at a high strain rate. The influences of the laser energy and mask pattern on the embossed structures are presented. Within certain limits, increasing laser energy is beneficial for making the embossment more convex. However, further excessively increasing the laser energy, the embossment will exhibit the height

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