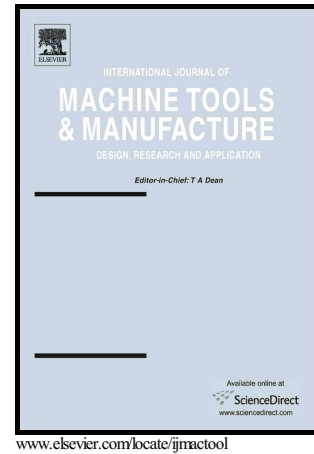


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# **A fundamental investigation on ultrasonic vibration-assisted laser engineered net shaping of stainless steel**

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## **Abstract**

Laser engineered net shaping (LENS), a laser beam deposition additive manufacturing method, has been utilized as a key technology in the direct manufacturing or repairing of metal parts. However, deposition defects such as pores, cavity, micro-cracks, residual stress, and uncertain microstructures always exist in the LENS fabricated parts, which will greatly affect the qualities and mechanical properties. In this paper, a novel ultrasonic vibration-assisted (UV-A) LENS process is proposed to reduce or eliminate the common defects due to the nonlinear actions and influences of ultrasonic vibration in molten materials. An experimental investigation is conducted on the effects of ultrasonic vibration on fabricated part geometry, powder utilization efficiency, surface roughness, geometry of molten pool and dilution zone, pores and micro-cracks, and grain size of the LENS-deposited AISI 630 stainless steel. The mechanical properties including tensile properties and hardness of the fabricated parts are evaluated and compared

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