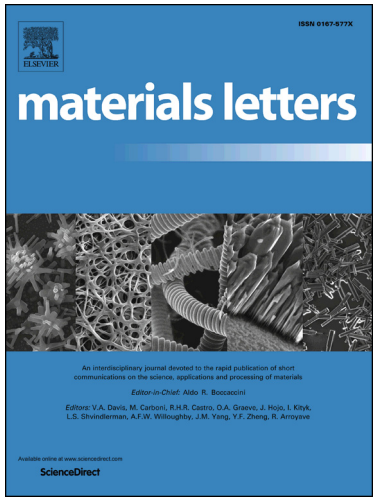


# Improving bending and dynamic mechanics performance of 3D printing through ultrasonic strengthening

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# Improving bending and dynamic mechanics performance of 3D printing through ultrasonic strengthening

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**Abstract**

Three-dimensional (3D) printed samples produced by fused deposition modeling (FDM) have low interlayer shear strength and poor bending mechanical properties owing to the technological characteristics of the accumulation of raster pattern and layers. The present study input ultrasonic vibration energy to 3D printed samples under pressure, and investigated the effects of ultrasonic vibration on the bending and dynamic mechanical properties of FDM 3D printed ABS samples. It was found that ultrasonic strengthening increased the bending strength of ABS samples by 10.8%, increased the bending modulus by 12.5%, and improved the dynamic mechanical properties. The combination of ultrasonic strengthening technology and FDM 3D printing technology can improve the flexural and dynamic mechanical properties of existing FDM 3D printed samples, and is important in broadening the application of 3D printed parts.

**Key words:** 3D printing; ultrasonic strengthening; additive manufacturing; polymers; mechanical properties; deposition

## 1. Introduction

The technology of fused deposition modeling (FDM) heats and melts materials through the use of nozzles. The extruded material is fused layer by layer until the whole three-dimensional (3D) entity is manufactured[1]. This technology has become the most widely used additive manufacturing technology because of its low cost, simple forming process, non-toxic raw materials, and ability to directly form 3D