

**Invited lecture**

# DETAILED CHARACTERIZATION OF PLA AND PLA RESIN ADDITIVELY MANUFACTURED MATERIALS

Zorana Golubovic

University of Belgrade, Faculty of Mechanical Engineering, 11000 Belgrade, Serbia

Corresponding author e-mail: [zzgolubovic@mas.bg.ac.rs](mailto:zzgolubovic@mas.bg.ac.rs)

## Abstract

*Polylactic acid (PLA) is the most widely studied and used thermoplastic material for additive manufacturing (AM) processes, alongside Acrylonitrile Butadiene Styrene (ABS). It belongs to a class of renewable and biodegradable polymers with versatile applications in various industries. So far, PLA has shown a relatively high modulus of elasticity and high tensile strength compared to other thermoplastic polymers. PLA has mainly been examined in its use in extrusion-based AM technology called Fused Deposition Modeling (FDM), in which material filaments are passed through a hot nozzle, melted, and deposited layer by layer on a build platform. The goal of this research was to characterize and compare the properties of PLA specimens produced in the form of filaments using an FDM printer with those of PLA specimens produced in the form of resin using a Digital Light Processing (DLP) printer. Unlike the FDM process, the DLP as one of the VAT photopolymerization processes, which involves placing the resin material in a tank and curing it with UV light emitted from an LCD screen, resulting in hardening of the polymer with pixel resolution. For mechanical testing, standardized specimens were prepared and tested on a standard testing machine. An optical microscope was used to determine surface properties and crack cross-sections. The results show that the mechanical properties of the PLA material favor the FDM technology and the filament type of the material, considering that the maximum stress and elastic modulus are higher and the specimens are tougher compared to the DLP specimens. However, DLP technology has the potential to be used with resin form of known filament materials, regardless of the lack of certain properties, by adjusting the printing parameters and specific requirements.*

## Keywords

Additive manufacturing, PLA, PLA resin, characterization, mechanical properties, microscopy.

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