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INVESTIGATING MECHANICAL PROPERTIES OF ADDITIVELY MANUFACTURED BIODEGRADABLE PLA MATERIAL

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Abstract

As the demand for sustainable and biodegradable materials grows, poly(lactic acid) (PLA) has emerged as a promising candidate due to its eco-friendly properties and versatility in additive manufacturing. This study investigates the mechanical behavior of PLA samples fabricated using the material extrusion (MEX) process, a widely used additive manufacturing technique. Through a comprehensive experimental approach, the research evaluates key mechanical properties, including tensile strength, torsional resistance, flexural performance, microhardness, and microscratch resistance. A CETR UMT-2 tribometer was employed to measure microhardness and microscratch resistance, providing valuable insights into PLA's wear performance. The results demonstrate that PLA exhibits excellent microscratch resistance and hardness values comparable to conventional polymers, making it a viable alternative to environmentally harmful plastics. Furthermore, mechanical testing under tensile, torsional, and flexural loads reveals promising strength characteristics, highlighting PLA's potential for applications in consumer goods, biomedical devices, and structural components. This study enhances the understanding of PLA's mechanical reliability, reinforcing its role as a sustainable material for next-generation manufacturing and engineering solutions.

Keywords: additive manufacturing, microindentation, microscratch, PLA, tensile

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