Aerobic Biodegradation of various light activated “3D” polymer resins and developing a temperature-controlled chamber

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ABSTRACT

Ultraviolet light-activated polymers used in Stereolithography (SLA) additive manufacturing are a growing tool in both industrial and domestic production of plastic components. Unlike traditional Fused Deposition Modeling (FDM) these polymers are often composed of various Volatile Organic Compounds (VOC) that have adverse environmental and health effects. To curb these effects, popular product manufacturers have produced “plant-based”, or “bio-based” advertised products. These products' effects are poorly understood and leave many questions regarding their long-term sustainability. This project specifically explores the fate of these alternative products in a commercial compost facility. Composting utilizes aerobic microorganisms to break down organic material into its mineral components. Composting reduces the volume of the original organic matter by converting it into carbon dioxide (CO_2) and water. This project is twofold 1) the design and testing of a commercial composting incubation chamber and 2) the impact of commercial composting conditions on the breakdown of these polymers. This research seeks to understand the fate of these compounds in a commercial composting facility by measuring the loss of mass from the original polymer and the evolution of CO_2 from the composting chamber over time.