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Use of biomaterials for large-scale additive manufacturing

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Oak Ridge National Laboratory (ORNL) is pioneering the use of bio-derived polymer materials for large-scale additive manufacturing. Large-scale polymer additive manufacturing is enabled using blending fibers with a resin matrix. The fibers provide dimensional stability for the resin and constitute anywhere between 10% and 40% by weight of the composite. Polylactic acid (PLA) is currently used as the bio-resin with a variety of bio-derived fibers, such as flax, bamboo and poplar. Several large-scale components and structures have been successfully printed with these materials leading to interest in the use of additional feedstocks. For example, bamboo/PLA was used successfully to print a large pavilion for an architectural display in December 2016. The use of poplar is of keen interest as this feedstock is a suitable energy crop in the USA. Poplar was milled and fractionated by particle size. Larger fibers were compounded with PLA and used for large-scale additive manufacturing while smaller sizes are attractive for biofuel production. An integrated process capable of supplying fiber for 3D printing and feedstock for biofuel production would be economically attractive. ORNL is currently evaluating the use of poplar for its suitability as a 3D printing material for large scale additive manufacturing and biofuel production.

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