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3D printable highly conductive and mechanically strong thermoplastic-based nanocomposites ILYASS TABIAI, DANIEL THERRIAULT, Ecole Polytech de Montreal — Highly conductive 3D printable inks can be used to design electrical devices with various functionalities and geometries. We use the solvent evaporation assisted 3D-printing method to create high resolution structures made of poly(lactid) acid (PLA) reinforced with multi-walled carbon nanotube (MWCNTs). We characterize fibers with diameters ranging between $100\mu m$ to $330\mu m$ and reinforced with MWCNTs from 0.5 up to 40wt% here. Tensile test, shrinkage ratio, density and electrical conductivity measurements of the printed nanocomposite are presented. The material's electrical conductivity is strongly improved by adding MWCNTs (up to 3000S/m), this value was found to be higher than any 3D-printable carbon based material available in the literature. It is observed that MWCNTs significantly increase the material's strength and stiffness while reducing its ductility. The ink's density was also higher while still being in the range of polymers' densities. The presented nanocomposite is light weight, highly conductive, has good mechanical properties and can be printed in a freeform fashion at the micro scale. A myriad of low power consumption with less resistive heating sensors and devices can potentially be designed using it and integrated into other 3D printable products.

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