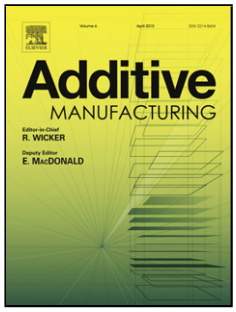

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Thermal analysis of additive manufacturing of large-scale thermoplastic polymer composites

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Highlights

- Large-scale polymer AM is very susceptible to part failure due to thermal warping.
- A 1D heat transfer model can predict the temperature evolution of thin walls.
- Parameter studies provide guidance for minimizing the likelihood of build failure.
- Higher thermal conductivity is shown to be detrimental to the success of the build.

Abstract:
The incremental deposition process utilized by most additive manufacturing (AM) technologies presents significant challenges related to residual stresses and warping which arise from repeated deposition of hot material onto cooler material. These issues are magnified at larger scale, where even a small thermal strain can correspond to several millimeters of deformation. In this work we investigate the thermal evolution in thin walls of carbon fiber/acrylonitrile butadiene styrene (CF/ABS) composite materials fabricated via Big Area Additive Manufacturing (BAAM). We measure the thermal evolution of composite parts during the build process using infrared imaging, and develop a simple 1D