

## **Numerical investigation of deposition characteristics of PLA on an ABS plate using a material extrusion process**

### **ABSTRACT**

Three-dimensional prototypes and final products are commonly fabricated using the material extrusion (ME) process in additive manufacturing applications. However, these prototypes and products are limited to a single material using the ME process due to technical challenges. Deposition of plastic on another dissimilar plastic substrate requires proper control of printing temperature during an ME process due to differences in melting temperatures of dissimilar plastics. In this paper, deposition of PLA filament on an ABS substrate during an ME process is investigated using finite element analysis. A heat transfer finite element (FE) model for the extrusion process is proposed to estimate the parameters of the ME machine for the formulation of a heat flux model. The effects of printing temperature and the stand-off distance on temperature distributions are investigated using the proposed FE model for the extrusion process. The heat flux model is implemented in a proposed heat transfer FE model of single bead deposition of PLA on an ABS plate. From this FE model of deposition, temperature histories during the ME deposition process are estimated. The results of temperature histories are compared with experiments. Using the calibrated FE model, a proper heating temperature of ABS for deposition of PLA is evaluated.