

APPLICATION OF POLYMER DERIVED CERAMICS FOR 3D PRINTING THERMAL MANAGEMENT SYSTEMS

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Manufacturing parts with complex geometry which are mechanically stable at high temperatures for different applications is a challenging problem in the aerospace industry. A class of materials which has potential in this application are called Polymer Derived Ceramics (PDCs). These PDCs are made by heat treatment of silicon-based polymers such as polysiloxanes which produce Silicon OxyCarbides. These ceramics can be tuned to have specific mechanical, thermal or electrical properties along with good shape fidelity based on formulation of the polymer and the filler material used.

Additive manufacturing or 3D printing the complex structures using Direct Ink Writing allows us to print parts with tuneable properties based on the fillers used in the feedstock, using equipment and methods that differ only a little from the more established Fused Deposition Modelling (FDM) printers that people are more familiar with. To establish predictive models on the printability of the feedstock and its accuracy in generating the desired structure, our work currently focuses on developing relationships between printing parameters and the resulting printed object.