

## 3-D Strain Mapping in Composite Pressure Vessels

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This investigation reports on the use of additively manufactured biaxial its shape and integrity to obtain accurate, low power readings after being strain gauge sensors for assessing the loads and deformations in a subjected to high temperatures during the post-curing process of CPVs. A linerless (type V) composite pressure vessel (CPV). Fused deposition small footprint and the lack of a permanently attached substrate allows the modeling (FDM) is a widely used rapid prototyping/additive placement of strain gauges integrated into the composite layer to have manufacturing technique due to its relatively fast processing time and minimal impact on the structural integrity of the pressure vessel. The low cost. However, additive manufacturing of strain gauge sensors using applications for this study include but are not limited to pressurant and FDM is uncommon because there are very few suitable conductive propellant tanks for launchers and spacecraft, self-contained breathing filaments commercially available. The filament selected for the strain apparatus, space habitats and alternative fuel tanks. gauge sensors in this study is a conductive polymer with low resistivity and high melting point which are crucial for the strain gauge to maintain

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