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RESEARCH ON 3D PRINTING METHOD OF CFRP VIA 5-DOF MOTION PLATFORM

Abstract

According to the demand for high strength composite material structure of space vehicle, in order to conquer the poor interlaminar shear strength shortcoming of the existed 3D printing method with 3 degrees of freedomDOF, the 3d printing method with 5-DOF motion platform of carbon fiber reinforced plastic (CFRP) has been proposed in this paper. Basic principle of using 3d printing technology and process method, the 5-DOF 3d printing platform has been constructed by programmable multi-axis motion controlPMAC technology. The space curved surface composed of arbitrary trajectories can be printed precisely through the linkage control of X, Y, Z axis linear motion and rotation around the X, Z axis, and the ideal fiber orientation structure of composite material has been obtained. Research and application results show that compared with 3-DOF methods, 5-DOF platform can enhance the mechanical properties of 3D printing CFRP structure, especially the connection strength between the layers, lay the foundation for fast and low-cost manufacturing of the space vehicle structure.

Keywords: CFRP, Space Vehicle Structure, 3D printing, 5-DOF, Arbitrary Surface