Characterization of Additive Manufactured SiCN ceramics

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Abstract

Polymer-derived ceramics (PDCs) are ceramic materials produced via the thermal degradation of polymeric ceramic precursor which can used in a wide range of applications, such as aerospace, defense, electronics, photonics, and biological purposes [1]. In this study, 3D printed polymer derived ceramics lattice structures were produced using the Digital Light Processing technique and pyrolyzed at 900 ℃, 1100 ℃ and 1300 ℃ as seen in Fig. 1. With increasing pyrolysis temperature, the ceramic yield decreased as the linear shrinkage increased which could be ascribed to either the reorganization of the microstructure of the ceramic material or the crystallization process. As seen in Figure 2, the XRD pattern of the pyrolyzed sample at 1300 ℃ depicted phases of SiO_2, β-SiC and carbon indicating the sharpness of the peaks at higher temperature. The carbon phases were confirmed with the Raman analysis. As shown in Figure 2, the Raman spectra exhibited two characteristic attributes of disordered graphitic carbon at 1332 cm−1 and 1620 cm−1, which correspond to the D and G bands, respectively [2]

References

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[2] X. Yang, P. Jiang, F. Sun, L. Yang, X. Fan, A pyrolysis heating rate based pressureless method for preparing dense and crack-free polymer-derived silicon oxycarbide bulk ceramics, Ceram. Int. 46 (2020) 10392–10399.

Figures

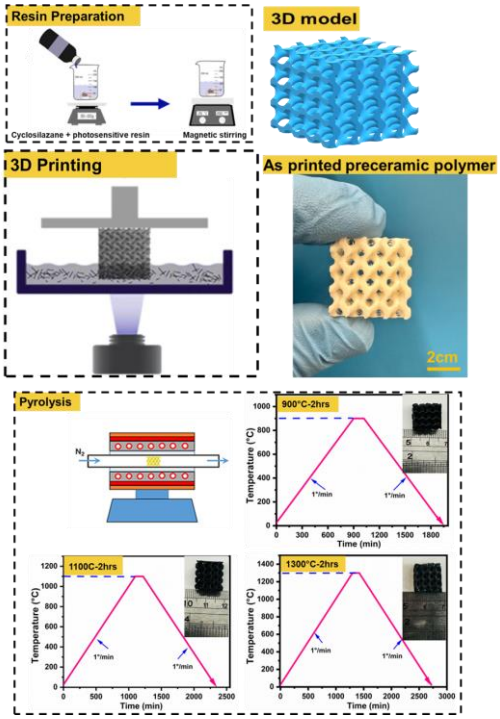

Figure 1: Experimental set-up

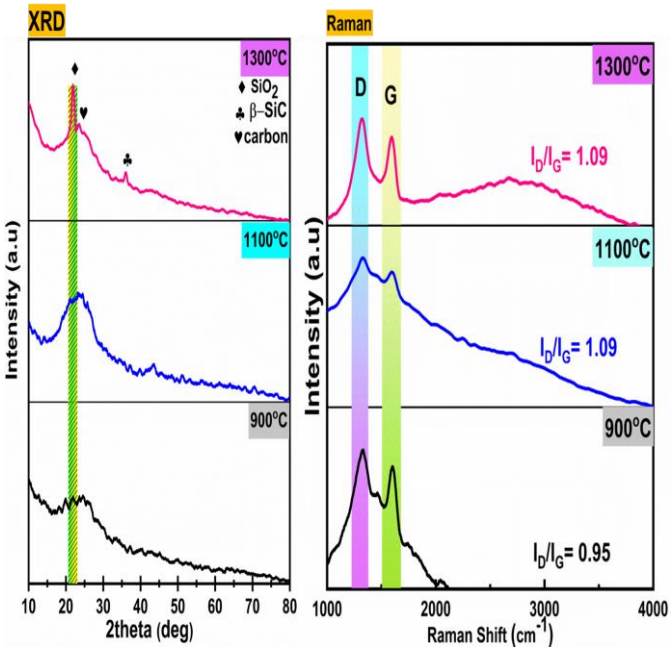

Figure 2: XRD and Raman Spectra of samples