Materials characterisation and mechanical properties of Cf-UHTC powder composites

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Figure Captions

Figure 1: X-ray micro-CT scan of the Cf preform structure.

Figure 2: Shapes and dimension of the samples for mechanical tests.

Figure 3: SEM characterisation of Cf-HfB_2 powder composite after C CVI and machining. (a) Across the entire thickness, (b,c) 0° orientation ply, (d,e) 90° orientation ply, (f,g) random orientation ply.

Figure 4: SEM-EDS analysis of a random orientation layer within a Cf-HfB_2 powder composite.

Figure 5: Porosity of Cf-HfB_2 powder composites.

Figure 6: Stress strain curves for Cf-HfB_2 powder composite.

Figure 7: Locations analysed by SEM for the fracture arising from the flexural tests.

Figure 8: Low magnification SEM images of Cf-HfB_2 powder composites after flexural testing. (a) Strongest sample; cross-section fracture view, (b) strongest sample; surface fracture view, (c) weakest sample; cross-section fracture view, (d) weakest sample; surface fracture view.

Figure 9: Locations analysed by SEM for the fracture arising from the interlaminar shear tests.

Figure 10: Low magnification SEM images of Cf-HfB_2 powder composites after interlaminar shear testing. (a) Strongest sample; part 1 cross-section, (b) strongest sample; part 1 fracture surface, (c) strongest sample; part 2 cross-section, (d) strongest sample; part 2 fracture surface,(e) weakest sample; part 1 cross-section, (f) weakest sample; part 1 fracture surface, (g) weakest sample; part 2 cross-section, (h) weakest sample; part 2 fracture surface.

Figure 11: Locations analysed by SEM for the fracture arising from the compressive tests.

Table Captions

Table 1: Dimensions and quantity of the Cf preforms and subsequent samples for mechanical testing.

Table 2: Bulk density of Cf-HfB2 powder composites after impregnation and after C-CVI and machining.

Table 3: Mechanical properties of Cf-HfB2 powder composites.