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Single-source-precursor synthesis of high temperature stable SiC/C/Fe nanocomposites from a processible hyperbranched polyferrocenylcarbosilane with high ceramic yield

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The present work opens a new synthetic route toward the preparation of high temperature stable SiC/C/Fe nanocomposites. In this paper, we investigated the relationship between nano/microstructure of the final ceramics and their properties, in a temperature range of 900-1300 °C. Further research to investigate nano/microstructure of the final ceramics at higher temperatures (≥ 1500 °C) is in progress. As shown in Fig. S1, compared with the 1300 ºC sample (Fig. 15), the SiFeC sample reveals an enhanced crystallization as shown in the SAED (Fig. S1(a)). In addition, the crystallites become much bigger as can be taken from the bright field lattice images (Fig. S1(b)). HRTEM imaging exhibits that α-Fe crystal boundary area is also comprised of turbostratic carbon (Fig. S1(c)), and poorly organized turbostratic carbon are dispersed in an amorphous SiC(O) matrix (Fig. S1(d)). The results indicate the exclusive existence of α-Fe in the SiC(O) matrix even at 1500 °C.

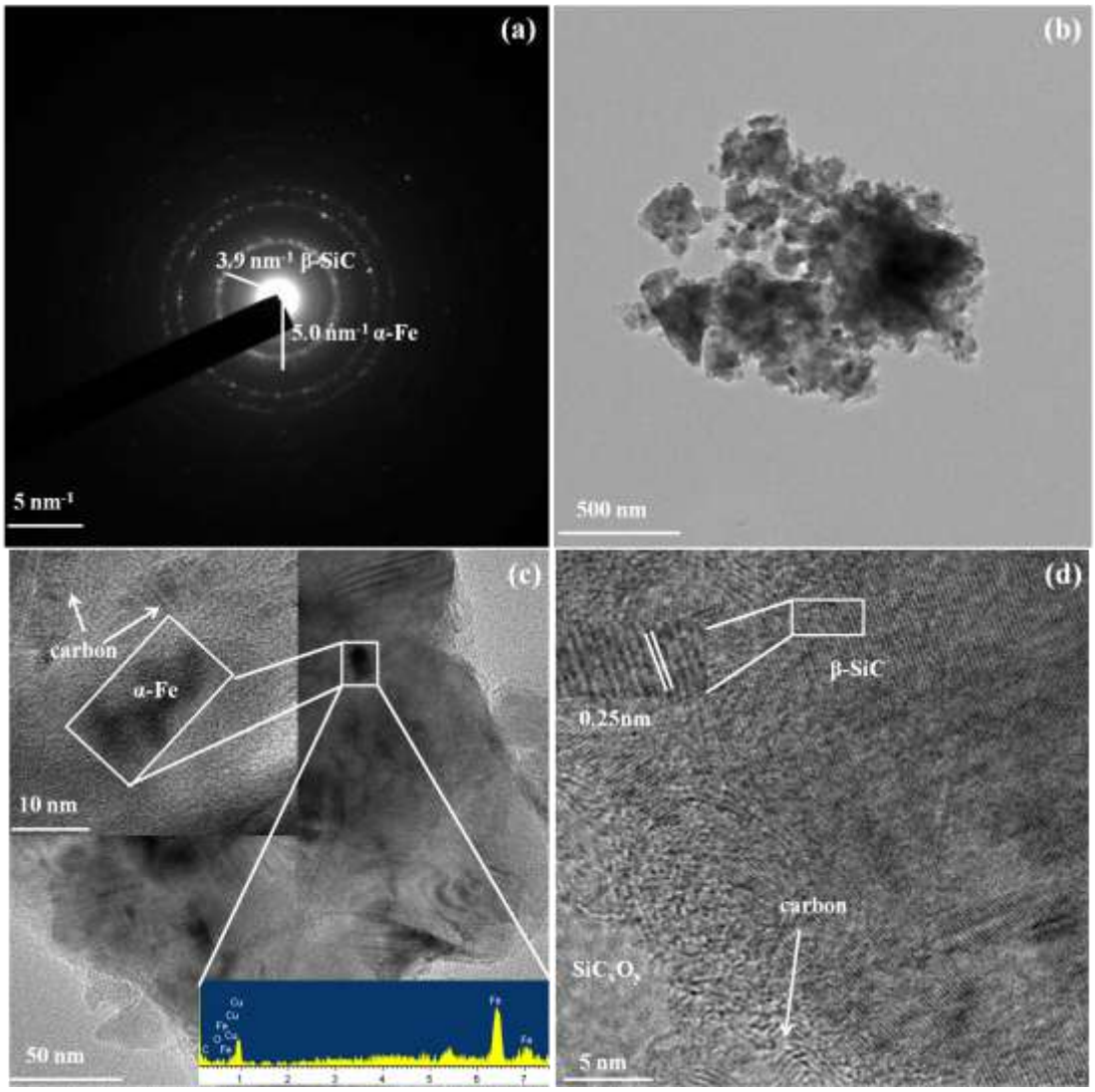

Fig. S1. (a) Selected area electron diffraction, (b) Bright field lattice images, (c) HRTEM images and (d) HRTEM images of HBPFCS-3-derived ceramics annealed at 1500 ºC.