

Electronic Supplementary Information

Large-scale, flexible and high-temperature resistant ZrO₂/SiC ultrafine fibers with radially gradient composition

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FTIR spectra of PCSZ precursor solution and as-spun fibers

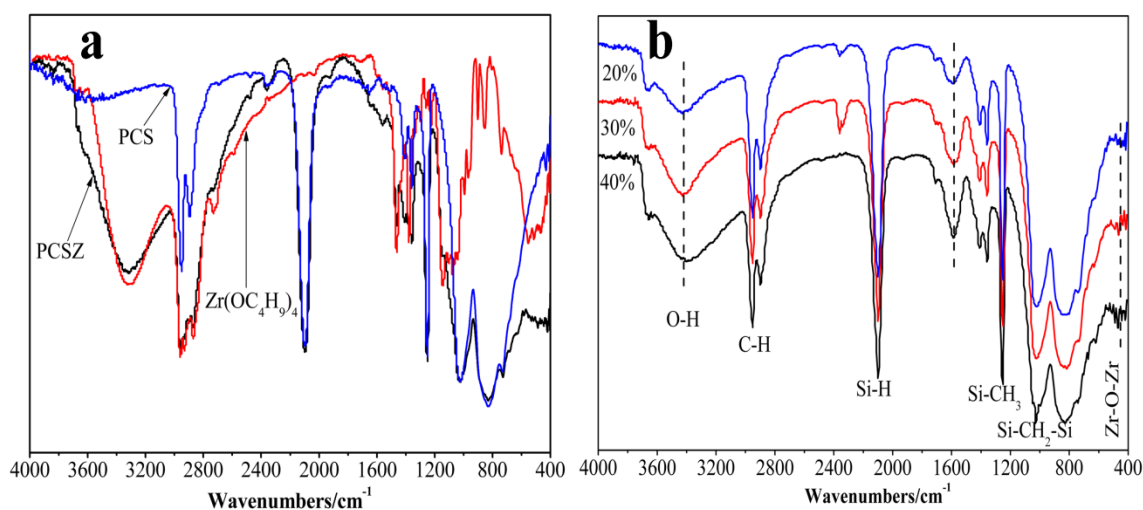


Fig.S1 (a) Comparative FTIR spectra of PCS, Zr(OC₄H₉)₄ and PCSZ precursor solution and (b) FTIR spectra of as-spun fibers with different Zr(OC₄H₉)₄ contents

In order to understand the reciprocity between PCS and Zr(OC₄H₉)₄ in precursor solution, FTIR spectra of PCS, Zr(OC₄H₉)₄ and PCSZ were recorded respectively and showed in Fig. S1. In the FTIR of Zr(OC₄H₉)₄, the bands at 2962, 2930 and 2872cm⁻¹ are attributed to C-H stretching vibration modes, while 1460 and 1370 cm⁻¹ are ascribed to the bending mode of C-H. The broad bands at 1142 and 1075cm⁻¹ are both assigned C-O stretching vibration and the band at 485cm⁻¹ is assigned to vibration of Zr-O-Zr mode. It could also be clearly seen that the main characteristic peaks of Zr(OC₄H₉)₄ appeared in PCSZ and did not change after mixing with PCS. And so was PCS. Also, as shown in Fig. S2b, the characteristic peaks of PCS in as-spun fibers

were not changed when the quality of $Zr(OC_4H_9)_4$ rose from 20 to 40 wt%. These results demonstrated that there was no covalent bond between $Zr(OC_4H_9)_4$ and PCS.

Large-scale as-spun fibers mat

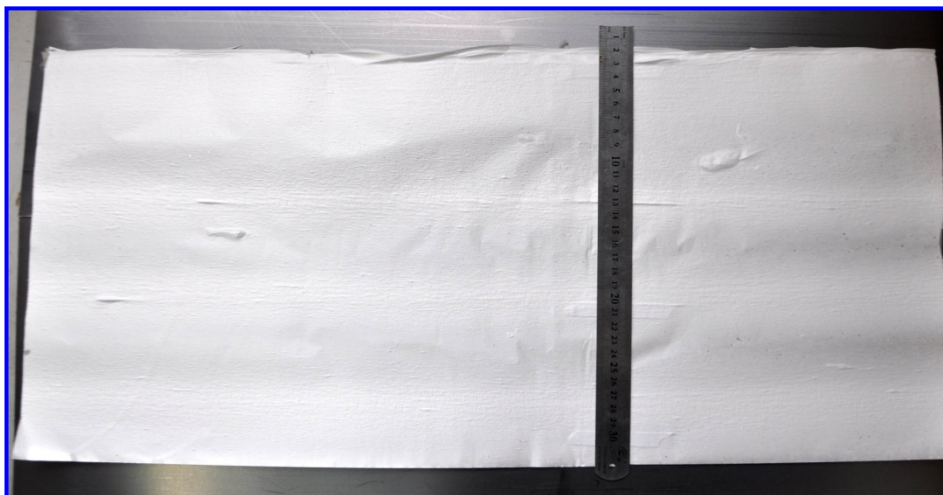


Fig. S2 As-spun fibers mat *via* multi-needle electrospinning process

The spun large-area ($30 \times 60 \text{ cm}^2$) mat in Fig. S2 were fabricated using four syringes. The area of fibrous mat can be highly increased by adding the number of syringe (see Fig. 1).