

Supporting information

Velcro®-Inspired SiC Fuzzy Fibers for Aerospace Applications

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KEYWORDS: Silicon carbide nanotubes and nanowires; carbon nanotubes; aerospace applications; in-situ mechanical testing; thermal stability

The full CNT to SiCNT/NW conversion was optimized at 5 hours. Before this time, the nanotubes have a silicon carbide outer layer with a carbon core. The SEM images of the 2-hour converted SiCNT/NW-SiCF in SI Figure 1 (a) and (b) show the nanotubes on the SiCF surface as well as the adhesion of many large Si/SiO₂ clusters. During the conversion, the CNT-SiCF is in contact with Si nanoparticles at high temperature. During the high temperature conversion process Si atoms bombard the CNTs, knocking out several carbon atoms which are replaced with Si atoms. After 2 hours, the SiCNT/NWs are partially converted where only some of the Si nanoparticles have reacted with the CNTs, leaving excess Si attached to the SiCNT/NW-SiCF which can turn to SiO₂ during cool down. During the 5 hour full conversion, all of the Si nanoparticles react with the sample, leaving negligible Si nanoparticles on the sample surface. The XPS of the 2hr and 5 hr conversion in SI Figure 1 (c) shows similar Si 2p peaks with slightly increased O peaks in the 2 hour sample most likely due to the adhered SiO₂ clusters. The Raman

of the comparison of CNT-SiCF (blue), 2hr SiCNT/NW-SiCF (magenta), and 5hr SiCNT/NW-SiCF (red) in SI Figure 1 (d) shows the significant increase in SiC peaks between 800-1000 cm^{-1} . In this figure, the presence of CNTs are evidenced with lower D-band-than-G-band peaks (1200-1500 cm^{-1}), which are present in CNT-SiCF (blue) and 2hr SiCNT/NW-SiCF (magenta), but not in the 5hr SiCNT/NW-SiCF (red).

SI Figure 1: (a) and (b) SEM images of 2hr converted SiCNT/NWs with scale bar 5 μm , (c) XPS and (d) Raman of: CNT-SiCF (blue), 2hr SiCNT/NW-SiCF (magenta), and 5hr SiCNT/NW-SiCF (red).

