Nano-Micro Letters

Supporting Information for

Temperature Arousing Self-Powered Fire Warning e-Textile Based on p-n Segmented Coaxial Aerogel Fibers for Active Fire Protection in Firefighting Clothing

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S1 Experimental Section

S1.1 Synthesis of Ag NWs@PDA

Firstly, 50 mg Ag NWs were dispersed in 90 mL water and then stir magnetically for 10 minutes. Secondly, 0.18 g DA and 760 μL NaOH aqueous solution (2 mol/L) were added to the above mixture followed by stirring for 7 h at 60 °C to obtain AgNWs@polydopamine (PDA) spinning dope.

S2 Supplementary Figures and Tables

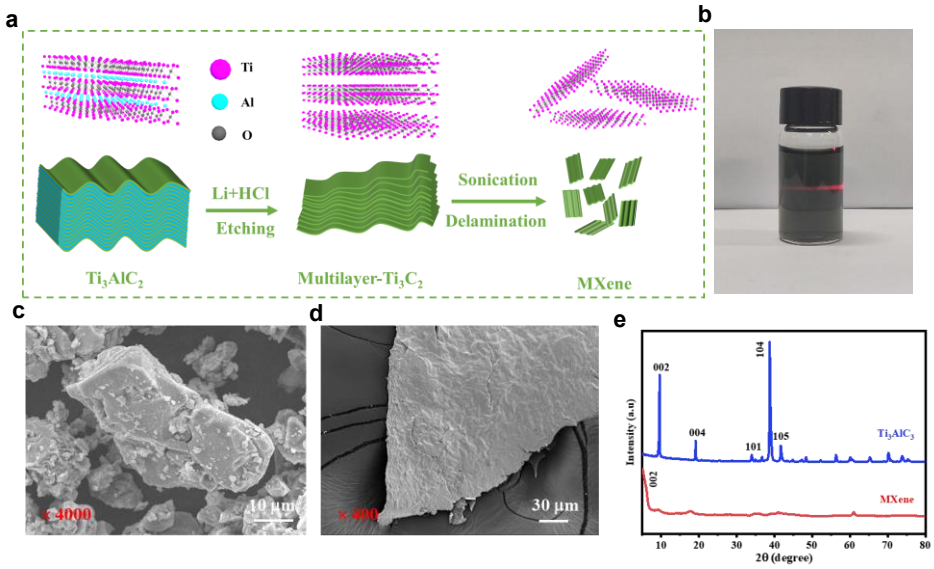

Fig. S1 a Fabrication schematic illustration of MXene nanosheets. **b** The digital image of MXene suspension. SEM images of **c** precursor Ti_3AlC_2 powder and **d** the MXene nanosheets with different magnifications. **e** X-ray diffraction patterns of Ti_3AlC_2 powder and MXene nanosheets

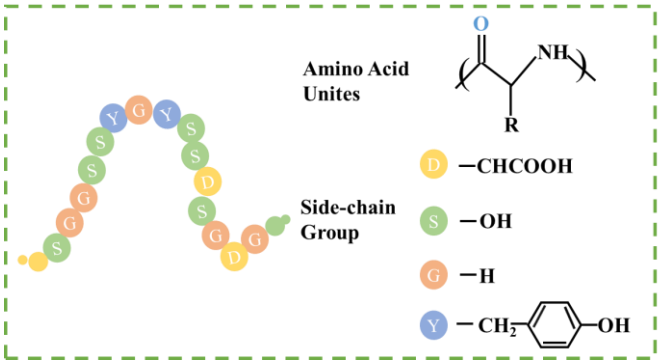

Fig. S2 Chemical structure of sericin

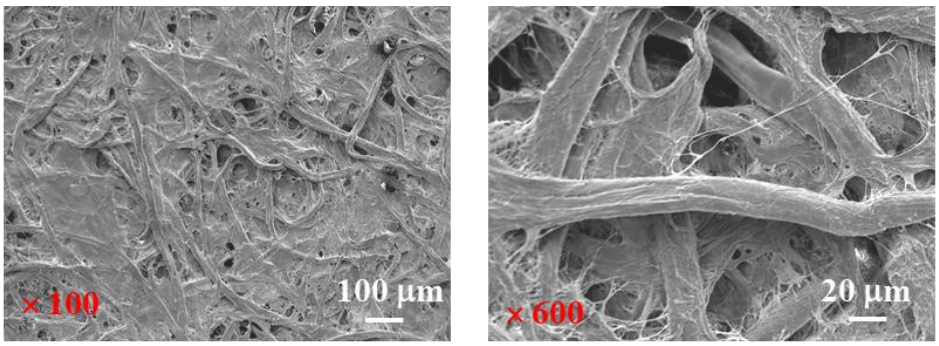

Fig. S3 SEM images of SWCNT-COOH with different magnifications

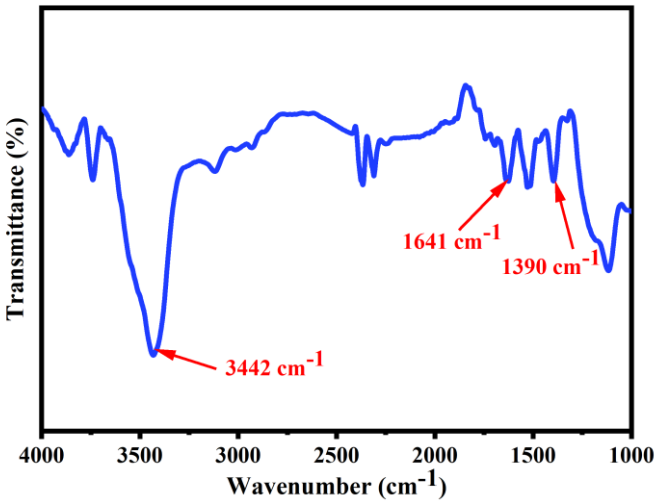

Fig. S4 FTIR spectra of SWCNT-COOH

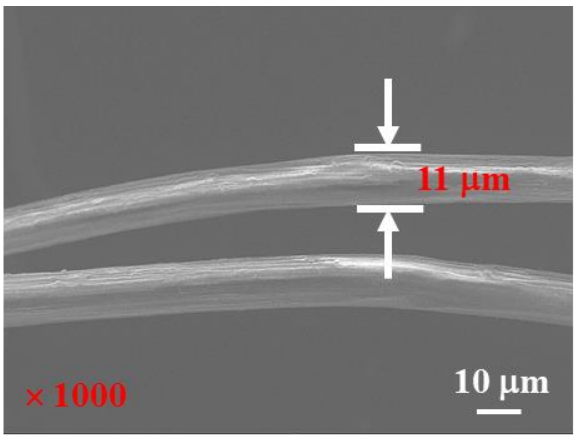

Fig. S5 SEM image of the surface morphology of commercial PPTA

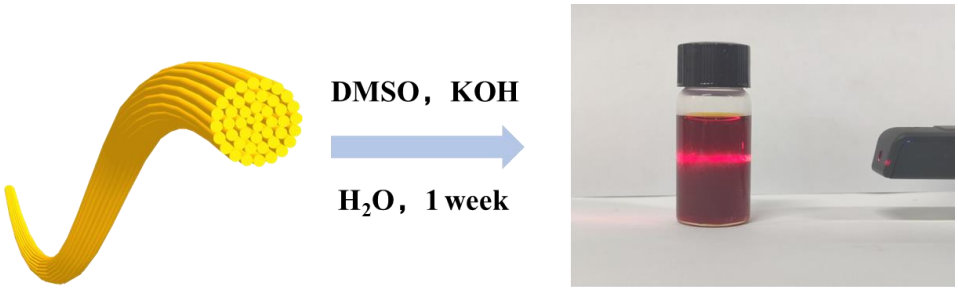

Fig. S6 Preparation process of the ANF dispersion

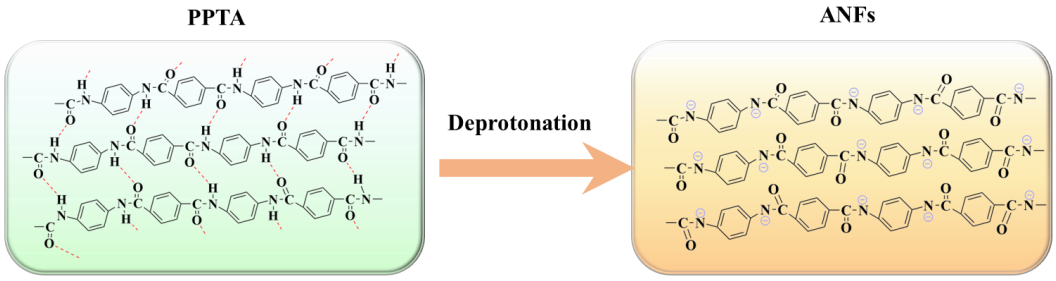

Fig. S7 Schematic diagram of PPTA fiber formation into ANFs dispersion in KOH/DMSO solution

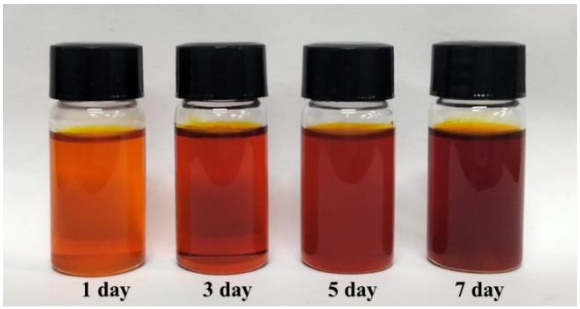

Fig. S8 Digital photos of ANFs/DMSO solutions at different dissolution times

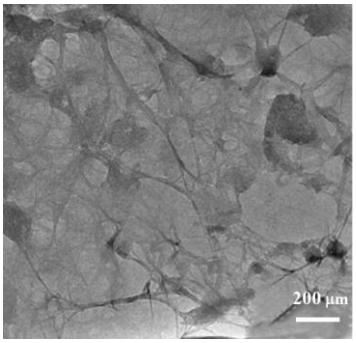

Fig. S9 TEM image of the as-prepared aramid nanofibers dispersion

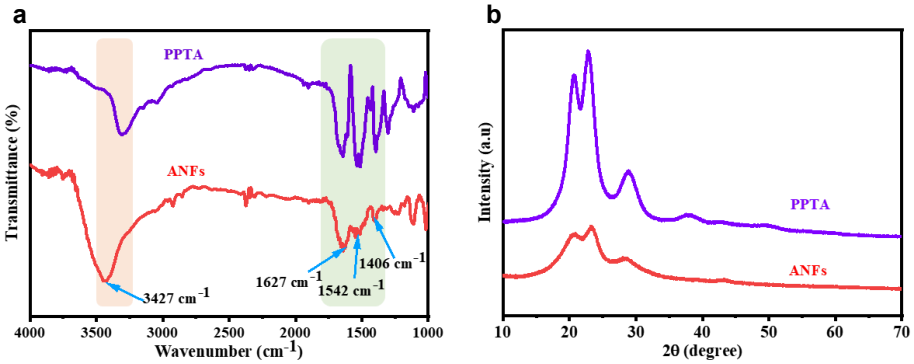

Fig. S10 a FTIR spectra and **b** XRD patterns of PPTA fibers before and after dissolution

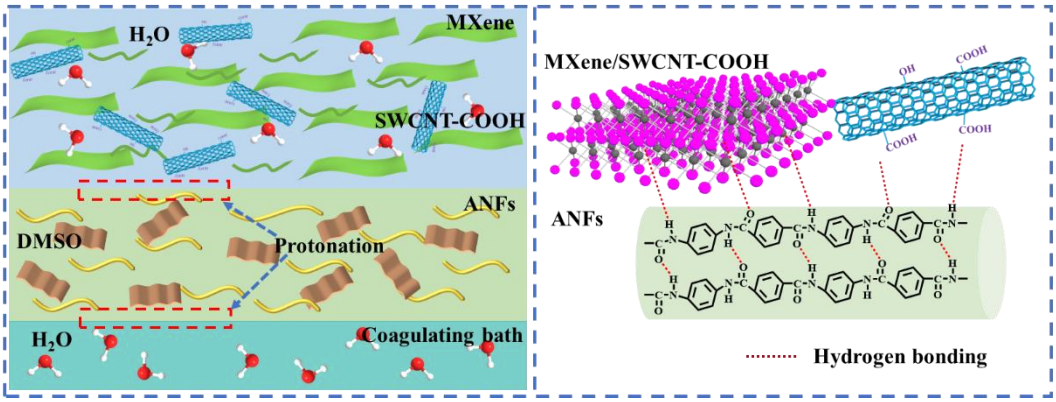

Fig. S11 Protonation process of ANFs, and the interfacial interactions among SWCNT-COOH, MXene and ANFs

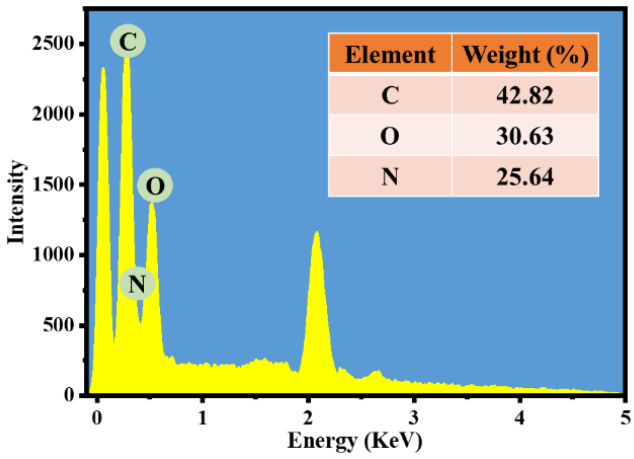

Fig. S12 EDX elemental mapping of p-n segmented TE fiber

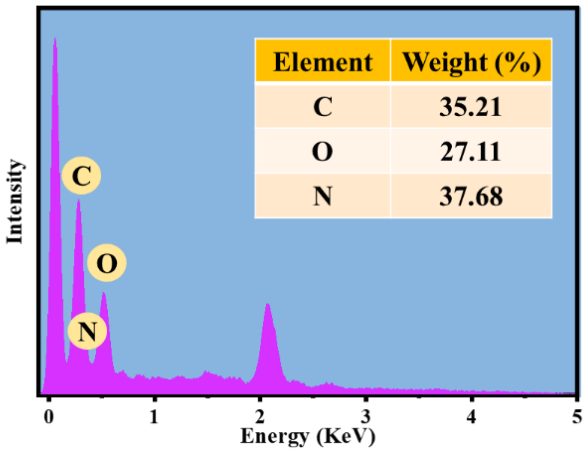

Fig. S13 EDX elemental mapping of p-n segmented TE fiber after being exposed to flame for 3 s

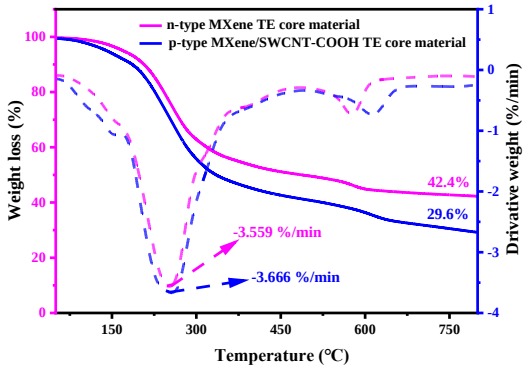

Fig. S14 TG and DTG curves of n-type MXene and p-type MXene/SWCNT-COOH TE core material in a nitrogen atmosphere

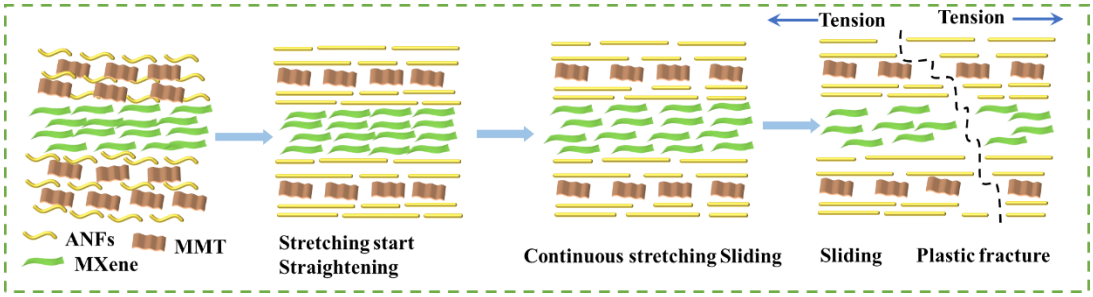

Fig. S15 Proposed fracture process of p-n segmented core-shell TE fiber

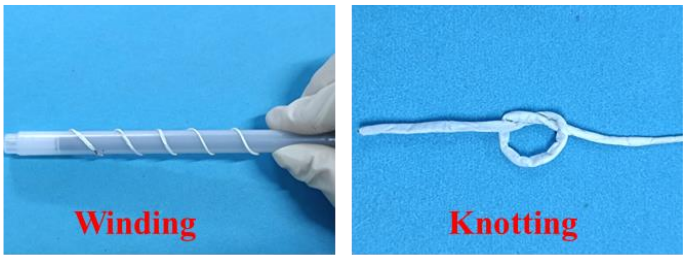

Fig. S16 Super flexibility of the p-n segmented core-shell TE fiber including winding and bending

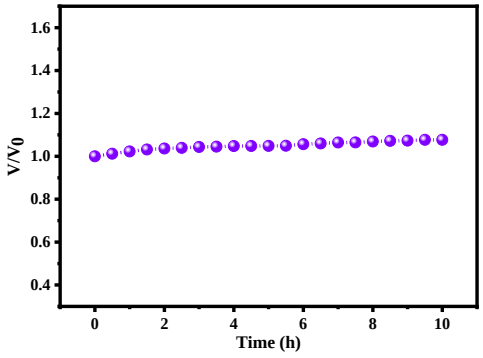

Fig. S17 The effect of washing times on output voltage of TET (0.5 h for each washing cycle)

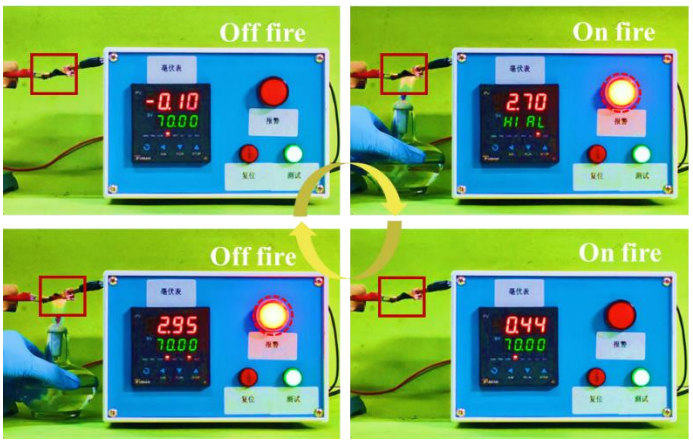

Fig. S18 TET exhibited rapid and repeated fire warning capability when exposed to flame

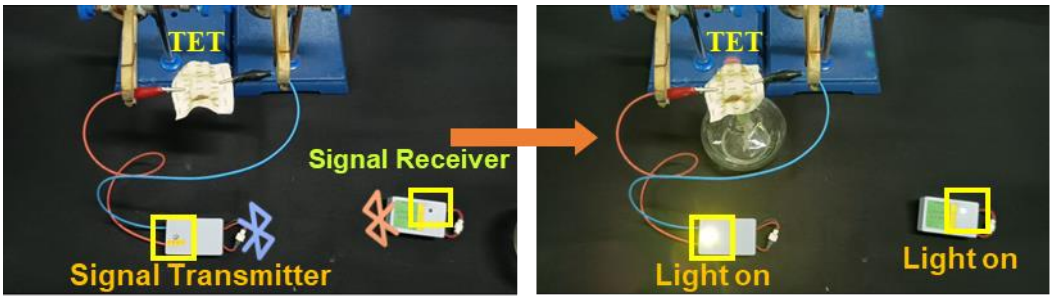

Fig. S19 Self-powered wireless fire warning test for TET indoors

Table S1 The standard for dividing the performance of aerogel fiber

Grade	Tensile strength (MPa)	Conductivity (mS/m)	Diameter (mm)	Knittability	Flexibility	Porosity (%)
1	<1	<1	<0.1			< 90
2	1-2	2-8	0.1-0.4	Unknittable	Inflexible	91-92
3	3-5	8-10	0.5-0.8	Knittable	flexible	93-95
4	6-10	11-15	0.9-1			96-98
5	>10	>15	>1			> 98