Electrical Supplementary Information for

Free-standing zirconia nanofibrous membranes with robust flexibility for corrosive liquid filtration

Yuecheng Chen,[‡ac] Xue Mao,[‡ac] Haoru Shan,[ac] Jianmao Yang,[ad] Huaping Wang,[ab] Shiyan Chen,[a] Feng Tian,[e] Jianyong Yu,[c] and Bin Ding*[abc]

[a] State Key Laboratory for Modification of Chemical Fibers and Polymer Materials, College of Materials Science and Engineering, Donghua University, Shanghai 201620, China

[b] Key Laboratory of High Performance Fibers and Products, Ministry of Education, Donghua University, Shanghai 201620, China

[c] Nanomaterials Research Center, Modern Textile Institute, Donghua University, Shanghai 200051, China

[d] Research Center for Analysis and Measurement, Donghua University, Shanghai 201620, China

[e] Shanghai Institute of Applied Physics, Chinese Academy of Sciences, Shanghai 201204, China

* Corresponding author. E-mail: binding@dhu.edu.cn; Phone: +86-21-62378202; Fax: +86-21-62378202

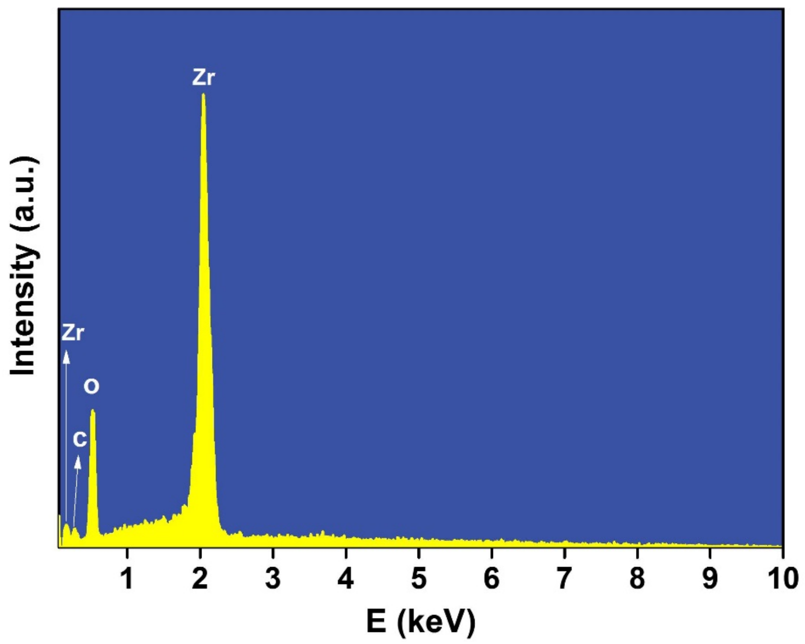

Fig. S1 EDS spectra of ZNF1@600 membranes.

TGA-DTG curves of hybrid nanofibrous membranes membranes

To investigate the thermal stability of the zirconia nanofibrous (ZNF) membranes, the hybrid nanofibrous (HNF) membranes were examined by a thermogravimetric analyzer from 100 to 900 °C (Fig. S2). As seen in Fig. S2, the weight of the HNF1 membranes decreases substantially in the low temperature region. Weight loss around 100-250 °C could be attributed to desorption of the moisture of the membranes. Degradation of PVP dehydration on the polymer side chain results in weight loss at 250-400 °C while the weight loss from 400 to 800 °C occurs as the C-C bonds of the polymer and acetate are cleaved.[1, 2] A total weight loss of 51.6% is observed in the range 100-800 °C. A ceramic yield of 48.4% remained with the chemical composition zirconia, which is far from the theoretical content of zirconia in HNF1 membranes (66.7%) due to the carboxyl and hydroxyl group in the HNF1 membranes.

Additionally, no weight loss of the HNF1 membranes after 800 ^{o}C, which indicates the excellent thermal resistance of ZNF membranes.

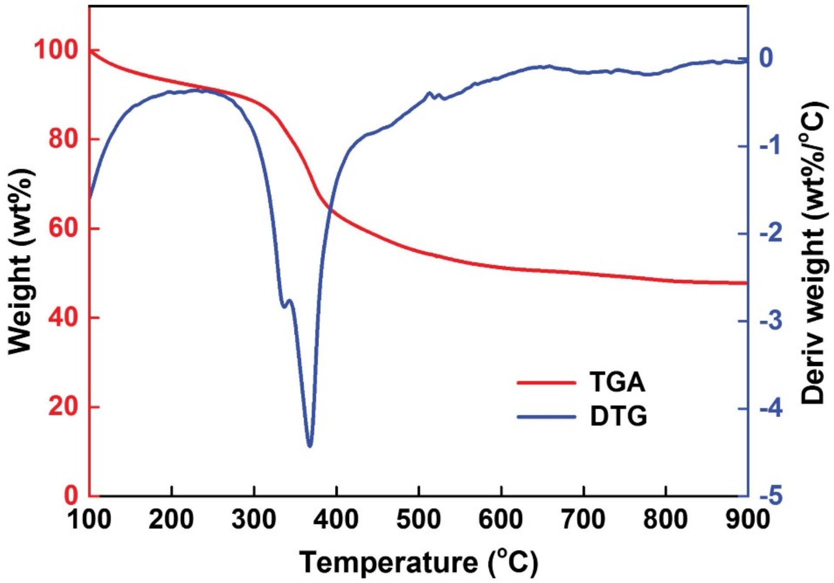

Fig. S2 TGA-DTG spectra of HNF1 membranes.

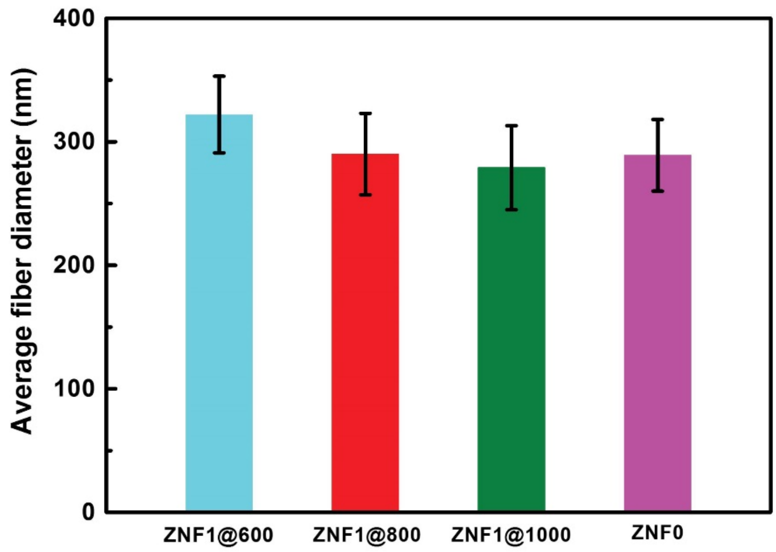

Fig. S3 The average diameter of ZNF1@600, ZNF1@800, ZNF1@1000, and ZNF0 fibers.

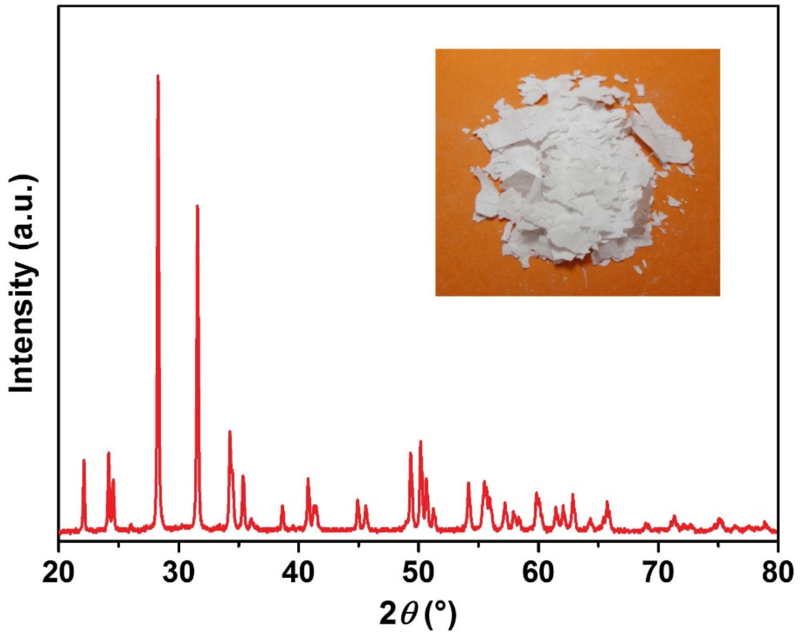

Fig. S4 XRD pattern of pure monoclinic ZNF membranes. The inset is the optical image of the corresponding membranes.

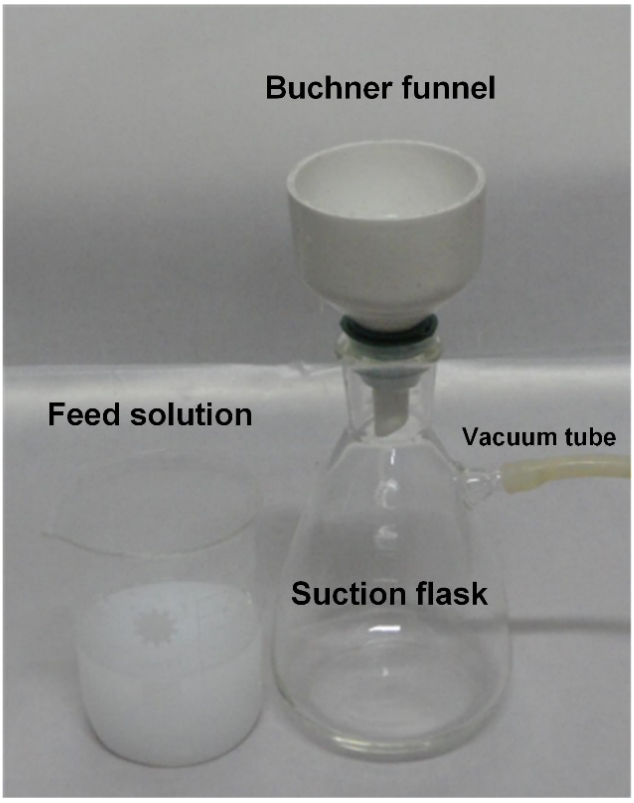

Fig. S5 The setup and feed solution for corrosive liquid filtration.

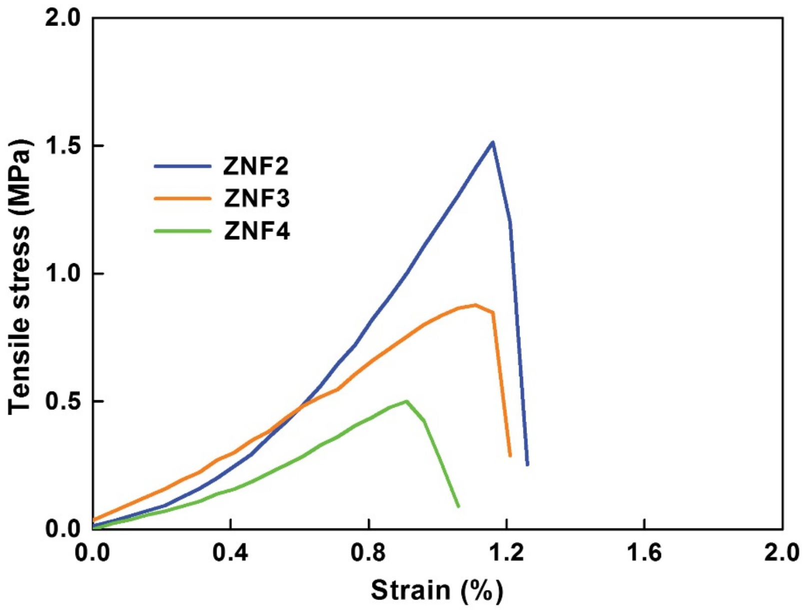

Fig. S6 Stress-strain curves of ZNF2, ZNF3, and ZNF4 membranes.

Table S1 Characteristics of various precursor solutions.

Sample	Precursor solutions: Y_2O_3/ZrO_2 (molar ratio)	Precursor solutions: ZrO_2/PVP (mass ratio)	Viscosity (cps)	Conductivity (mS cm^{-1})	Surface tension (mN m^{-1})
HNF0	0	2/1	1255±9.1	164.1±1.5	49.06±0.13
HNF1	0.03/1	2/1	1338±4.8	147.5±0.96	47.78±0.21
HNF2	0.03/1	2.5/1	485.3±1.5	150.5±0.50	47.54±0.82
HNF3	0.03/1	3/1	336.8±0.45	157.8±0.93	48.61±0.13
HNF4	0.03/1	3.5/1	212.0±3.8	167.7±1.2	48.43±0.16

References

1. K. Lin, L. Chen, M. Prasad and C. Cheng, *Adv. Mater.*, 2004, **16**, 1845.

2. J. Qiao, T. Hamaya and T. Okada, *Polymer*, 2005, **46**, 10809.