

Supporting Information

1

2

3 **3D Ti₃C₂T_x MXene-matrigel with electroacoustic stimulation** 4 **to promote the growth of spiral ganglion neurons**

5

6 Menghui Liao^{1,2,#}, Yangnan Hu^{1,2,#}, Yuhua, Zhang¹, Kaichen Wang³, Qiaojun Fang¹,
7 Yanru Qi¹, Yingbo Shen³, Hong Cheng¹, Xiaolong Fu¹, Mingliang Tang^{1,4,5,*}, Shan
8 Sun^{6,*}, Xia Gao^{2,*}, Renjie Chai^{1,5,7,8,9,*}

9

10 ¹ State Key Laboratory of Bioelectronics, Department of Otolaryngology Head and
11 Neck Surgery, Zhongda Hospital, School of Life Sciences and Technology, Advanced
12 Institute for Life and Health, Jiangsu Province High-Tech Key Laboratory for Bio-
13 Medical Research, Southeast University, Nanjing, 210096, China.

14 ² Department of Otorhinolaryngology-Head and Neck Surgery, Affiliated Drum Tower
15 Hospital of Nanjing University Medical School, Nanjing, 210008, China.

16 ³ Chien-Shiung Wu College, Southeast University, Nanjing 210096, China.

17 ⁴ Institute for Cardiovascular Science & Department of Cardiovascular Surgery of the
18 First Affiliated Hospital, Medical College, Soochow University, Suzhou, 215000,
19 China.

20 ⁵ Co-innovation Center of Neuroregeneration, Nantong University, Nantong, 226001,
21 China.

22 ⁶ ENT Institute and Otorhinolaryngology Department of Eye & ENT Hospital, State
23 Key Laboratory of Medical Neurobiology and MOE Frontiers Center for Brain Science,
24 Fudan University, Shanghai, 200031, China.

25 ⁷ Department of Otolaryngology Head and Neck Surgery, Sichuan Provincial People's
26 Hospital, University of Electronic Science and Technology of China, Chengdu, China.

27 ⁸ Institute for Stem Cell and Regeneration, Chinese Academy of Science, Beijing, China.

28 ⁹ Beijing Key Laboratory of Neural Regeneration and Repair, Capital Medical

29 University, Beijing, 100069, China.

30

31 #These authors contributed equally to this paper.

32

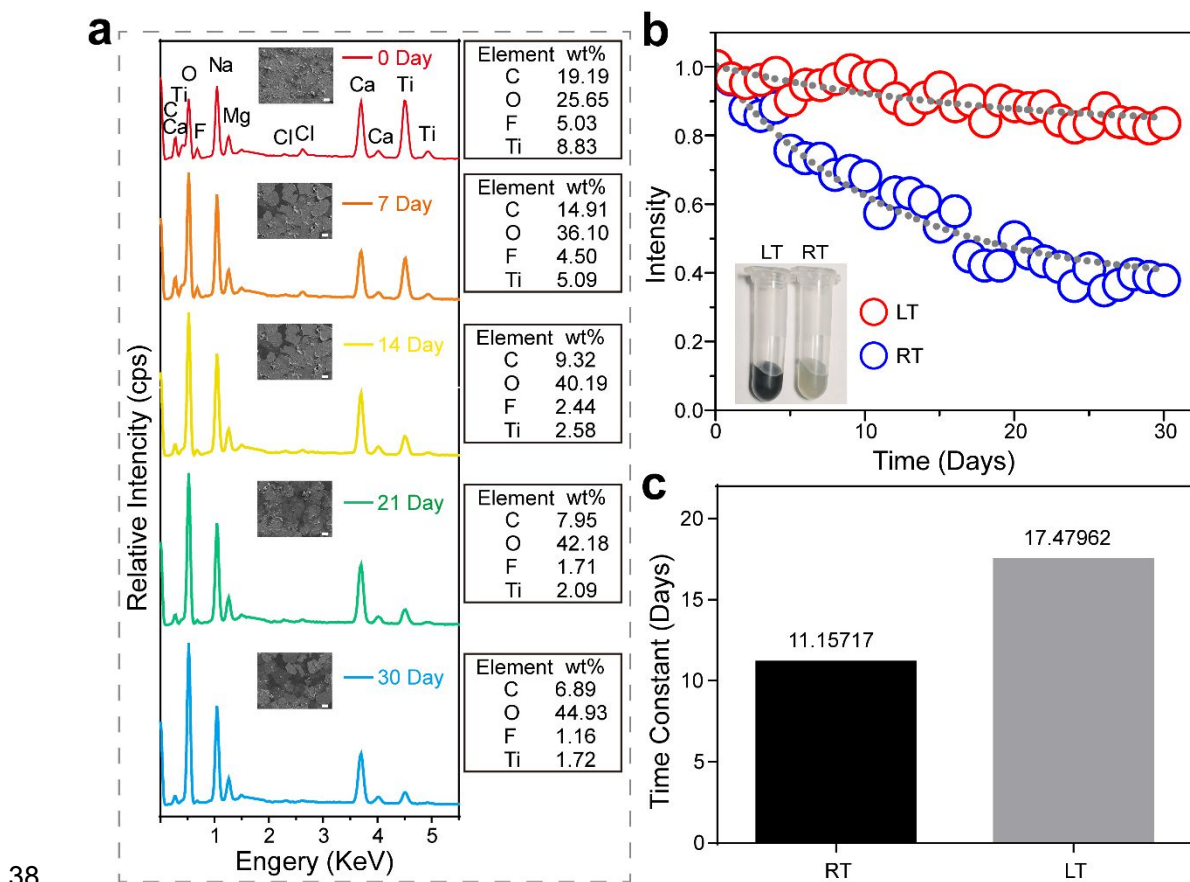
33 *Corresponding authors: Drs. Renjie Chai: renjie@seu.edu.cn, Xia Gao:

34 xiagaogao@hotmail.com, Shan Sun: Shansun@fudan.edu.cn and Mingliang Tang:

35 mltang@suda.edu.cn.

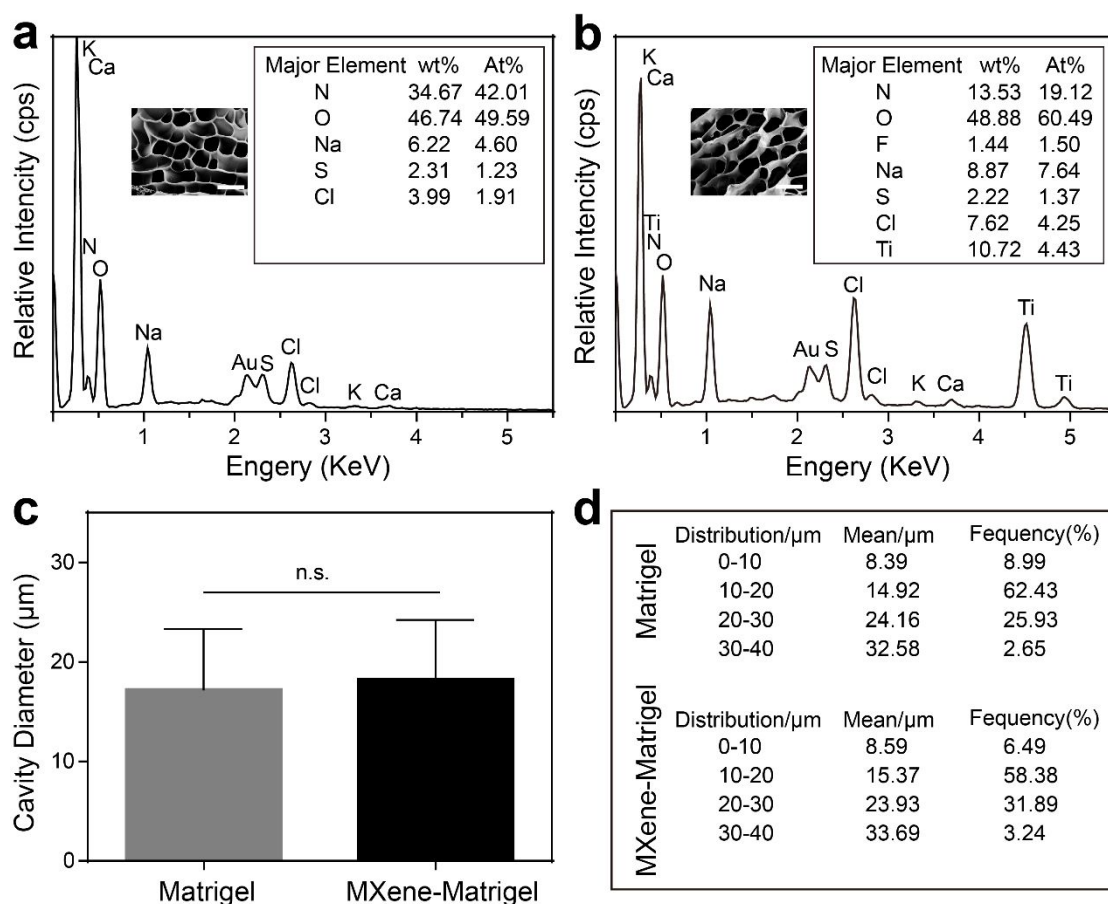
36

37 *Supplementary figures and figure legends*

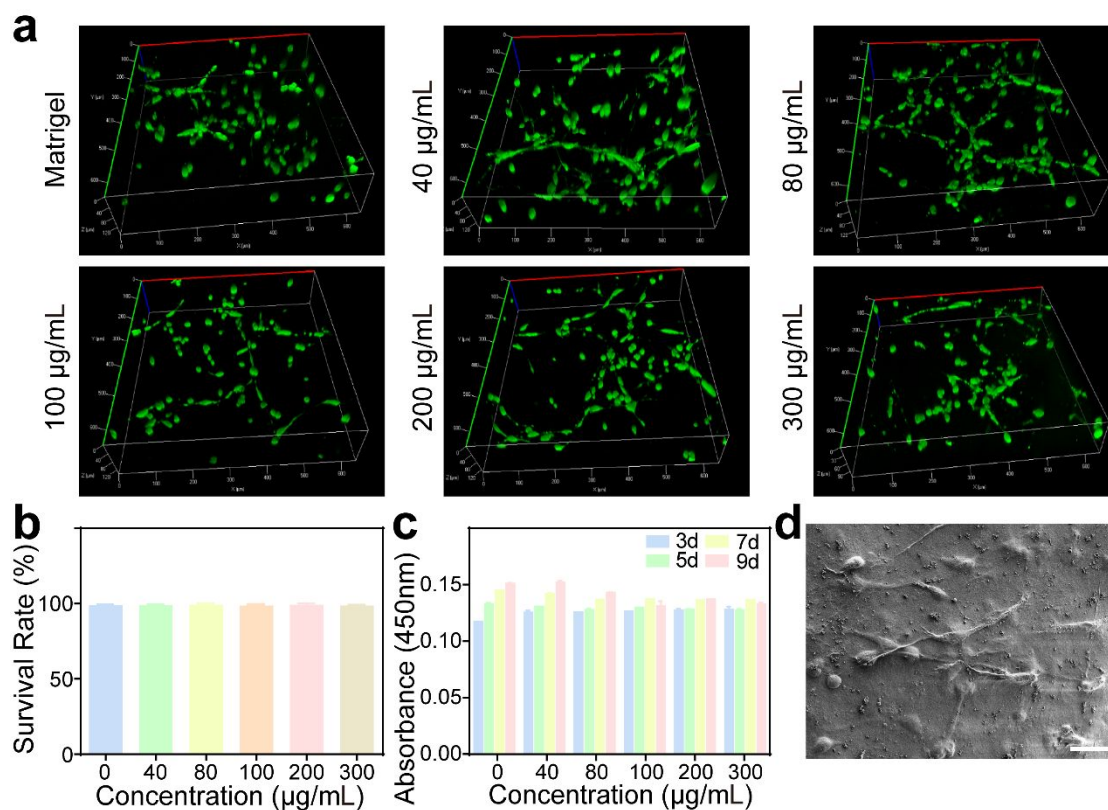


38

39 Supplementary Figure 1. The $Ti_3C_2T_x$ MXene nanosheet degraded slowly over time.
 40 (a) SEM-EDX results of $Ti_3C_2T_x$ MXene stored for different times. Scale bar=2 μm . (b)
 41 Absorbance attenuation curve of $Ti_3C_2T_x$ MXene aqueous solution stored at low
 42 temperature (LT) and room temperature (RT) in the dark. The dotted lines were fitted
 43 according to the exponential decay function $f(x) = y_0 + Ae^{-x/\tau}$. Lower left was the color
 44 contrast of $Ti_3C_2T_x$ MXene (0.3mg/mL) stored in LT and RT at day 30. (c) Time
 45 constants of $Ti_3C_2T_x$ MXene in LT and RT environments.



46
 47 Supplementary Figure 2. $Ti_3C_2T_x$ MXene was successfully integrated into the matrigel.
 48 (a) SEM-EDX mapping of matrigel hydrogel. (b) SEM-EDX mapping of $Ti_3C_2T_x$
 49 MXene-matrigel hydrogel. wt%: weight percentage, At%: atom percentage. Scale
 50 bar=20 μm . (c) The cavity diameter of the matrigel and $Ti_3C_2T_x$ MXene-matrigel
 51 hydrogel. (d) Statistical results of grouping the cavity diameters of the matrigel and
 52 $Ti_3C_2T_x$ MXene-matrigel hydrogel.



54

55 Supplementary Figure 3. $Ti_3C_2T_x$ MXene-matrigel hydrogel was an excellent scaffold
 56 for SGNs. (a) Representative fluorescence images of live/dead staining of SGNs
 57 cultured in $Ti_3C_2T_x$ MXene hydrogels with different concentrations. Entire cytoplasm
 58 of live cell was labeled with Calcein-AM (green), and nuclei of dead cell was labeled
 59 with EthD-1 (red). (b) The proportion of Calcein-AM positive cells. (c) The cytotoxicity
 60 of matrigel hydrogel and $Ti_3C_2T_x$ MXene-matrigel hydrogels with different
 61 concentrations to SGNs from CCK-8. (d) Representative SEM image of SGNs cultured
 62 in $Ti_3C_2T_x$ MXene hydrogel for three days. Scale bar=20 μm . Data are presented as
 63 mean \pm SD.