Supporting Information

Electromagnetic indction drives electron-hole separation in optoelectronic nerve conduit to accelerate nerve repair

Cijun Shuai [a,b], *Feng Ding* [a], *Xiaosong Chen* [a], *Huarui Zhou* [c], *Hongyi Qian* [d], *Yifeng Wang* [d], *Yanyan Chen* [e], *Fangwei Qi* [a,*], *Xinna Bai* [f,*]

[a] Institute of Bioadditive Manufacturing, Jiangxi University of Science and Technology, Nanchang, 330013, China;

[b] State Key Laboratory of Precision Manufacturing for Extreme Service Performance, College of Mechanical and Electrical Engineering, Central South University, Changsha, 410083, China;

[c] Faculty of Materials Metallurgy and Chemistry, Jiangxi University of Science and Technology, Ganzhou, 341000, China;

[d] Shenzhen Shaanxi Coal Hi-tech Research Institute Co., Ltd, Shenzhen, 518107, China;

[e] Chongqing Academy of Metrology and Quality Inspection, Chongqing, 401121, China;

[f] Department of Conservative Dentistry & Endodontics, Hunan 3D Printing Engineering Research Center of Oral Care & Xiangya Stomatological Hospital & Xiangya School of Stomatology, Central South University, Changsha, Hunan, China.

[*] Correspondences: qfw@jxust.edu.cn, baixinna@csu.edu.cn

S1. Reactive Oxygen Species Detection

The enhanced electron-hole separation promoted ROS generation, with results supplemented in Fig. S1. In this work, the ROS species mainly included singlet oxygen ($^1O_2$) and hydroxyl radical (·OH). The $^1O_2$ and ·OH generated by the conduits were detected by 1, 3-diphenylisobenzofuran (DPBF) and methylene blue (MB), respectively. As shown in Fig. S1a, with NIR irradiation and rotating MF for 15 min, the Bi_2S_3@PPy-PLLA group displayed a lower absorbance than the PLLA and Bi_2S_3-PLLA groups, indicating that the Bi_2S_3@PPy-PLLA scaffold possessed the stronger $^1O_2$ generation ability. As shown in Fig. S1b, with NIR irradiation and rotating MF for 15 min, the absorption peak intensity of MB solution immersed with Bi_2S_3@PPy-PLLA dramatically decreased than the other groups at 660 nm, indicating that the Bi_2S_3@PPy-PLLA conduit had excellent ·OH generation performance. Therefore, the enhanced electron-hole separation promoted ROS generation.

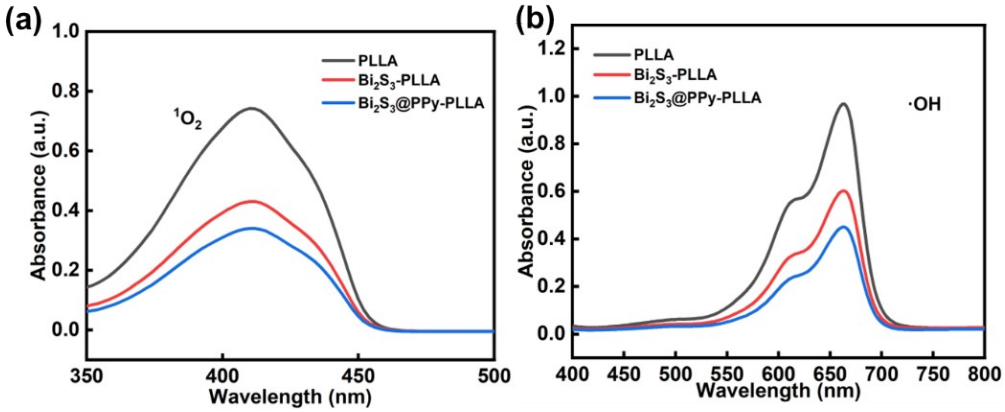

Fig. S1. (a) Absorption spectra of the DPBF solutions photogenerated $^1O_2$ capability with various conduits after 15 min. (b) Absorption spectra of the MB solutions photogenerated ·OH capability with various conduits after 15 min.

S2. Photothermal Analysis of Conduits

The photothermal property of the conduit was measured using thermal imaging experiments in PBS solution. Due to the fact that in cell experiments, the conduit was irradiated with NIR (0.5 W, 808 nm) for 20 s followed by dark with 40 s, and the cycle was 20 times a day, the photothermal experiment was also tested according to these parameters, with results shown in Fig. S2. Obviously, the initial temperature of PBS solution was 31.0 ℃. After 20 s of NIR radiation, the temperature of PBS solution increased to 33.4 ℃, which shown a photothermal effect. Subsequently, after without NIR for 40 s, the temperature gradually decreased to 31.7 ℃. Therefore, the temperature rise under the above parameter was not significant and would not damage to the BMSCs.

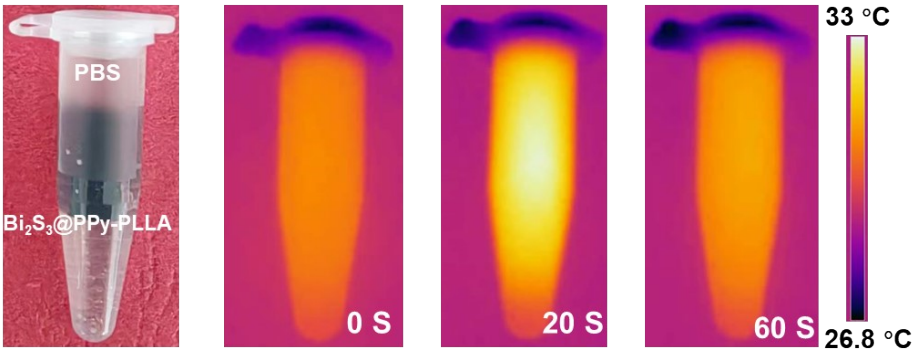

Fig. S2. Thermal imaging variation of Bi_2S_3@PPy-PLLA conduit