

## Supporting Information

### **Improve rotator cuff healing after surgical repair via suppressing reactive oxygen species by sustained release of Se**

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#### **Supplementary Experimental Section**

##### **1.1. Chemicals and reagents.**

All reagents were used without further purification. Copper (I) chloride (CuCl), polyvinyl pyrrolidone (PVP, K30), ammonium hydroxide (25%-28%) and anhydrous ethanol are analytically pure and were purchased from Sinopharm Chemical Reagent Co. (Shanghai, China), and tetraethylorthosilicate (TEOS, GR), selenium powders, oleic acid, oleylamine (approximate C18 from 80-90%) were obtained from Aladdin.

##### **1.2. Characterization.**

Sizes and morphologies of the nanoparticles were determined by a transmission electron microscope (TEM) using JEM-2100F microscope. Powder X-ray diffraction (XRD) was measured by a D/max-2550 PCX-ray diffractometer (Rigaku, Japan). Fourier transform infrared spectroscopy (FTIR) spectra were obtained using the L160-8000 spectrometer (PerkinElmer, MA) under ambient surroundings. A Leeman Laboratories Prodigy high-dispersion inductively coupled plasma atomic emission spectroscopy (ICP-AES) was used to measure the content of Se in the solution.

##### **1.3. Synthesis of Cu<sub>2-x</sub>Se nanocrystal.**

Cu<sub>2-x</sub>Se nanocrystals were prepared by a thermal injection method according to previous research.<sup>1</sup>

Briefly, 39.5 mg of selenium powders was mixed with 5 mL oleic acid (OA) in a three-neck bottle flask and heated to 120 °C under a nitrogen atmosphere to remove moisture and moisture. Subsequently, the mixture were heated to 280 °C and and then cooled to 220 °C to prepare Se-OA precursor for following use. In another three-neck bottle flask, the mixtures of 5 mL oleylamine (OAM) , 5 mL OA and 49.5 mg of CuCl were heated to 120 °C with magnetic stirring under a nitrogen atmosphere to remove moisture and moisture. Subsequently, the mixtures were heated to 220 °C and maintained for 5 min. The dark solution was formed after the above Se-OA precursor being quickly injected. And the resulting solution was maintained at 220 °C for 5 min and then rapidly cooled to 60 °C. Then the above solution were washed by centrifuging three times with ethanol. Finally, the  $\text{Cu}_{2-x}\text{Se}$  nanocrystals were dispersed in 10 mL of normal hexane for later use.

#### 1.4. Cell culture and viability measurements.

Human fibroblast cells were seeded in a 96-well plate and cultured in 5%  $\text{CO}_2$  at 37 °C for 24 h. The culture medium was replaced and cells were incubated with complete medium containing porous  $\text{Se@SiO}_2$  nanocomposites, at a series of concentrations in 5%  $\text{CO}_2$  and 95% air at 37 °C in a humidified incubator for further 24 h, respectively. Then cell viabilities were measured by Cell Counting Kit-8 system (CCK-8) according to manufacture's instructions.

#### Supplementary Figures

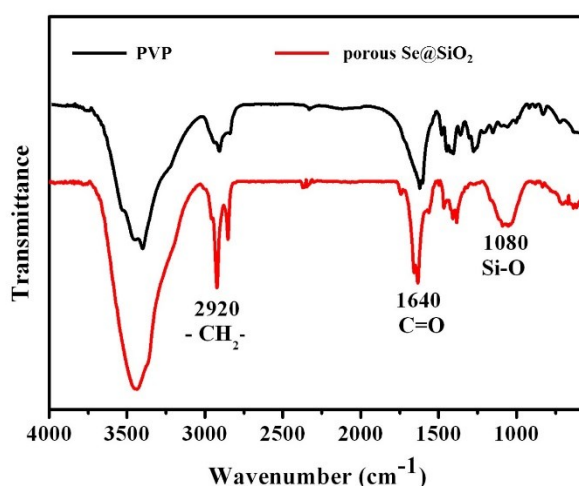


Fig. S1. FTIR spectra of porous  $\text{Se@SiO}_2$  nanocomposites(lower) and PVP(upper).

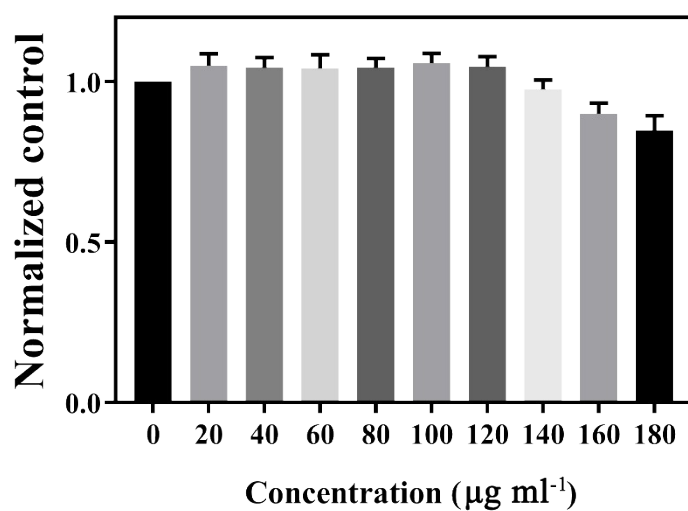


Fig. S2 Cell viability of human fibroblast cells incubated with porous Se@SiO<sub>2</sub> nanocomposites for 24 at different concentrations.

#### References

1. X. Liu, X. Wang, B. Zhou, W. C. Law, A. N. Cartwright and M. T. Swihart, *Adv. Funct. Mater.*, 2013, 23, 1256-1264.