Electronic Supplementary Material (ESI) for Nanoscale.

Supporting Information

Injectable, self-healing mesoporous silica nanocomposite hydrogels with improved mechanical properties

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1. Structural characterization of MSNs

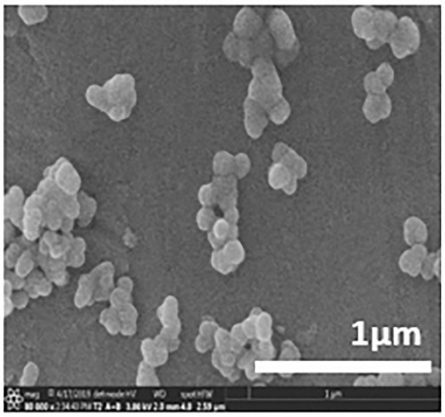
a)

	MSN-NH2in-SHout	MSN-OH
Average Size (DLS)	158.5	248
PDI	0.112	0.180

b)

	MSN-NH2in-SHout	MSN-OH
FITC	226623	35
ATTO-633	200623	24

c)



d)

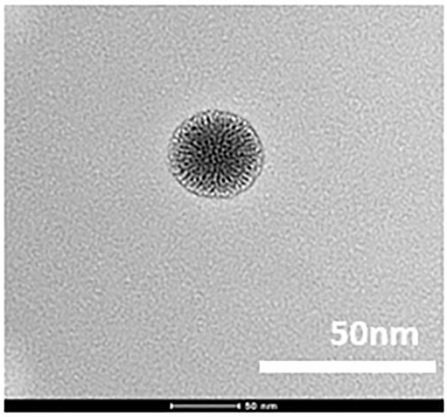


Fig. S1 Structural characterization of MSNs. (a) DLS results of the core-shell functionalized MSNs and non-functionalized MSNs**.** (b) Fluorescence intensity (a.u.) of FITC-NHS and ATTO 633-labeled synthesized MSNs. (c) SEM image and (d) TEM image of MSN-OH.

2. Crosslinking MSNs increased the mechanical properties of PEG gels

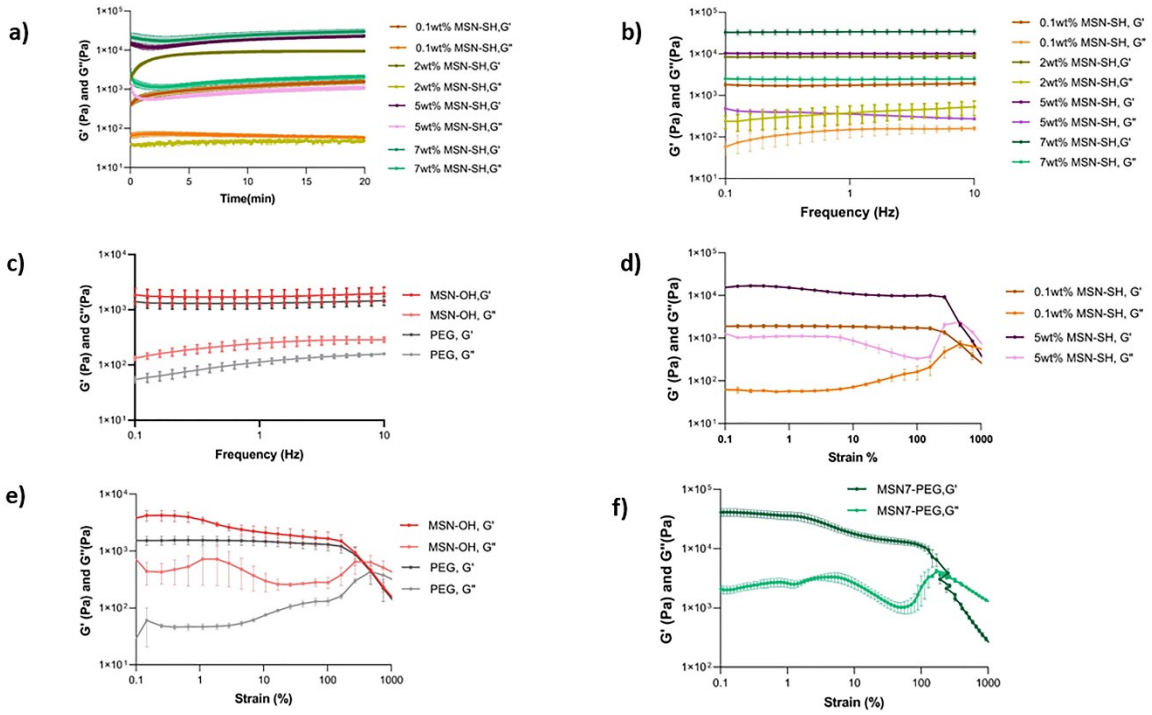


Fig. S2 Rheological analysis of all the hydrogel formulations (MSN0.1-7-PEG, MSN-OH and PEG). (a) Time sweep test at a constant strain of 1% and frequency of 1 Hz for all MSN-PEG formulations. (b) Oscillatory frequency sweep test at a constant strain of 1% for MSN-OH-PEG and PEG gels. (c) Oscillatory amplitude sweep test at a constant frequency of 1 Hz for MSN0.1-PEG and MSN5-PEG gels, in the range of 0.1 to 100%. (d) Oscillatory amplitude sweep test at a constant frequency of 1 Hz for MSN-OH-PEG and PEG gels, in the range of 0.1 to 100%. (e) Oscillatory amplitude sweep test at a constant frequency of 1 Hz for MSN7-PEG gels in the range of 0.1 to 100%. All the measurements were done at 20 °C and they are presented as mean ± SEM for n = 3 per experimental condition.

3. MSN-PEG nanocomposite hydrogels are self-healing.

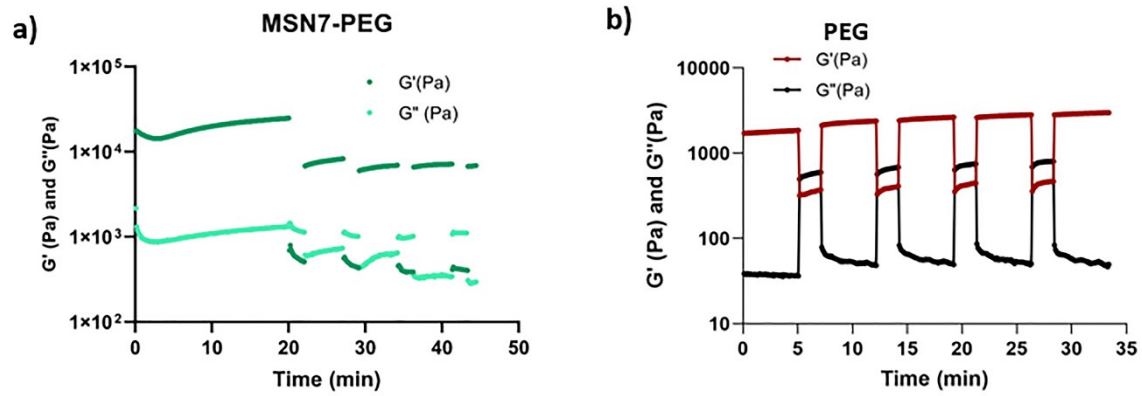


Fig. S3 Cyclic strain sweep test to evaluate the self-healing behavior of the hydrogels. (a) Self-healing tests for MSN7-PEG (a) and pristine PEG (b) hydrogels.

4. Equilibrium swelling degree, degradation and drug release ability of MSN-PEG nanocomposites

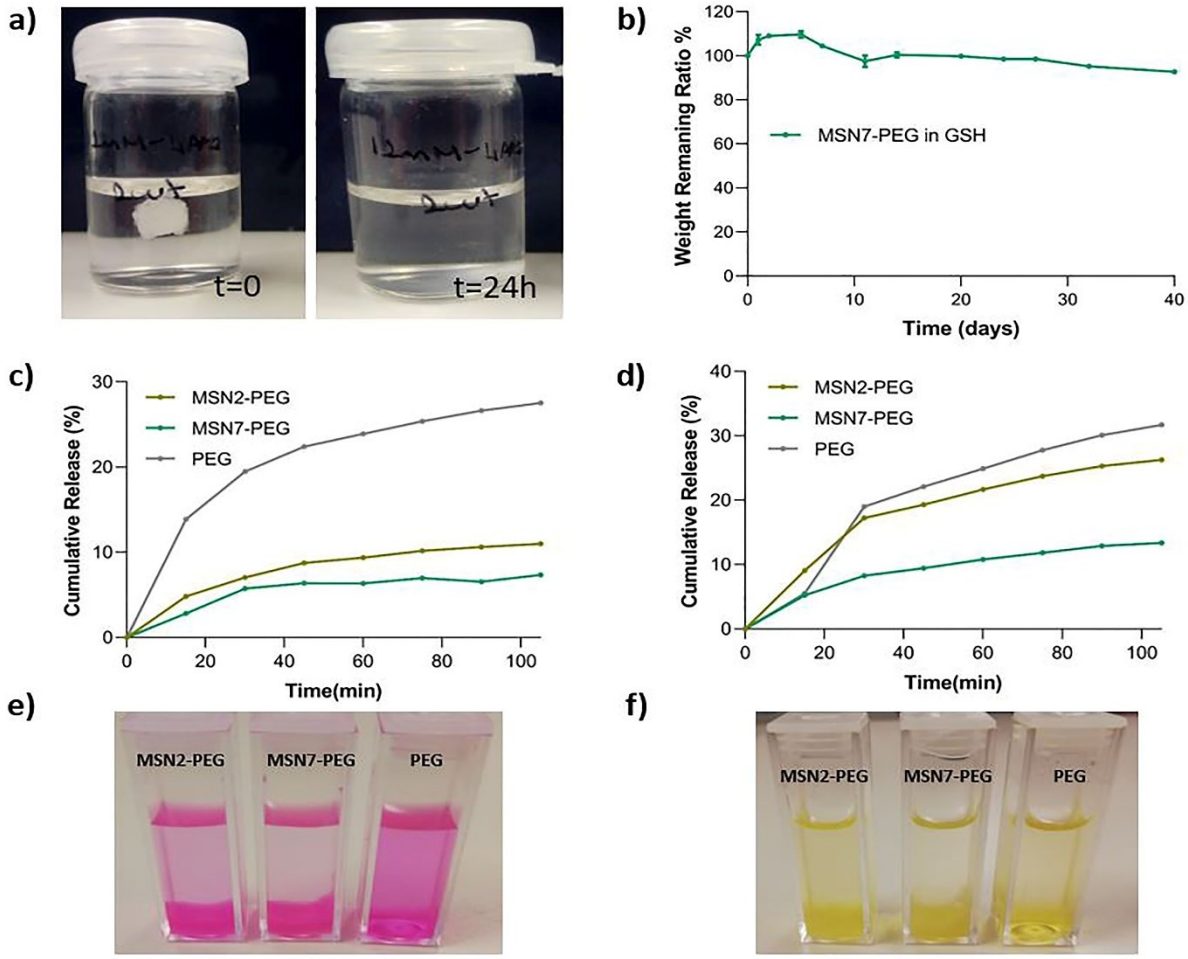


Fig. S4 Degradation and drug release ability of MSN-PEG nanocomposites. (a) MSN2-PEG completely degraded within 24 h in 10 mM glutathione. (b) Degradation of MSN7-PEG hydrogels in 300 μM GSH

at 37 °C. (c) Cumulative release of RhoB release from the hydrogels after 105 min incubation at room temperature. (d) Cumulative release of albumin-FITC release from the hydrogels. (d, e) The representative image of released RhoB (d) and of the released albumin-FITC (e) from MSN2-PEG, MSN7-PEG, and pristine PEG after 105 min.