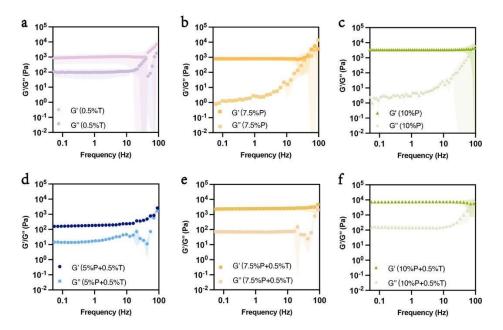
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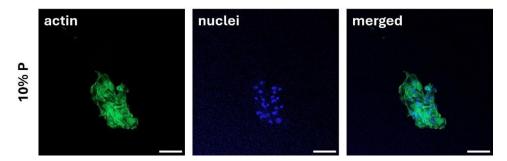
## Supplementary Information for

Improving the bioactivity and mechanical properties of poly(ethylene glycol)-based hydrogels through a supramolecular support network

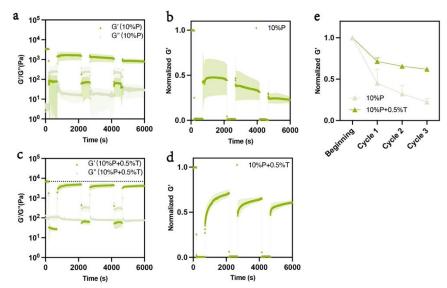
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**Figure S1.** Rheological Analysis of PEGDM/Trpzip Hydrogels. **(a-c)** Frequency sweep measurements of the storage (G') and loss modulus (G") for hydrogels composed of 0.5% (w/v) Trpzip, 7.5% (w/v) PEGDM, and 10% (w/v) PEGDM, showing the response to increasing strain. **(d-f)** Frequency sweep measurements of the storage (G') and loss modulus (G") for hybrid hydrogels with 5%, 7.5%, and 10% (w/v) PEGDM combined with 0.5% (w/v) Trpzip indicating the influence of Trpzip on the mechanical behavior and frequency tolerance of the PEGDM network. All tests were performed in triplicate (n=3).



**Figure S2.** Morphology and Quantitative Analysis of ADSCs Cultured on PEGDM Hydrogels After 2 Days. Confocal microscopy images of adiposederived stem cells (ADSCs) cultured on 10% (w/v) PEGDM hydrogel formulations stained for nuclei (blue, DAPI) and actin (green, phalloidin) after 2 days. Scale bar: 100  $\mu$ m.



**Figure S3.** Self-healing properties of PEGDM/Trpzip hydrogel. **(a)** and **(c)** are thixotropic measurements of storage modulus (G') and loss modulus (G") of 10% (w/v) PEGDM and 10%PEGDM/ 0.5% (w/v) Trpzip hydrogels. Their normalized storage modulus (G') changes are shown in **(b)** and **(d)**. **(e)** The changes of the normalized mean value of storage modulus (G') in each cycle of 10% (w/v) PEGDM and 10%PEGDM/ 0.5% (w/v) Trpzip hydrogels. All tests were performed in triplicate (n=3)

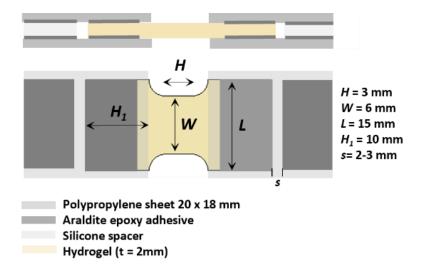
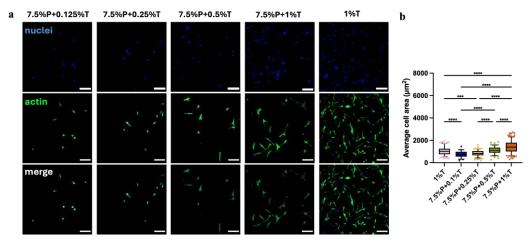
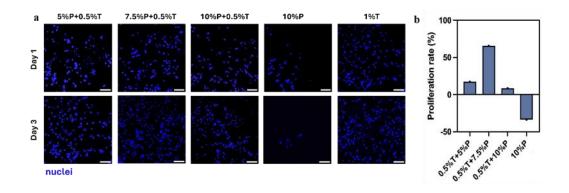


Figure S4. Tensile testing sample design.



**Figure S5.** Morphology and Quantitative Analysis of ADSCs Cultured on PEGDM/Trpzip Hydrogels After 2 Days. **(a)** Confocal microscopy images of adipose-derived stem cells (ADSCs) cultured on various hydrogel formulations stained for nuclei (blue, DAPI) and actin (green, phalloidin) after 2 days. The different hydrogel formulations include 0.5% (w/v) Trpzip, 7.5% PEGDM + 0.125% Trpzip, 7.5% PEGDM + 0.25% Trpzip, 7.5% PEGDM + 0.5% Trpzip, and 7.5% PEGDM + 1% Trpzip. Scale bar: 100  $\mu$ m. **(b)** Box plot showing the average cell area ( $\mu$ m²) of ADSCs across different hydrogel formulations. Statistical significance was determined using one-way ANOVA with p-values indicated by '\*'p<0.1, '\*\*\*'p<0.01, '\*\*\*\*'p<0.001, '\*\*\*\*\*'p<0.0001.



**Figure S6.** Cell proliferation of ADSCs Cultured on PEGDM/Trpzip Hydrogels After 1 and 3 Days. **(a)** Confocal microscopy images of adipose-derived stem cells (ADSCs) cultured on various hydrogel formulations stained for nuclei (blue, DAPI) after 1 and 3 days. The different hydrogel formulations include 0.5% (w/v) Trpzip, 5% PEGDM + 0.5% Trpzip, 7.5% PEGDM + 0.5% Trpzip, and 10% PEGDM + 0.5% Trpzip. Scale bar: 100  $\mu$ m. **(b)**The proliferation rate of each hydrogel comparing from Day 1 and Day 3 culturing.