Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Supplementary Information

Electrospun Polyurethane Scaffold Reinforced Zwitterionic Hydrogel as Biocompatible Device

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Supplementary Text

1) Contact angle of ePU and SRgel.

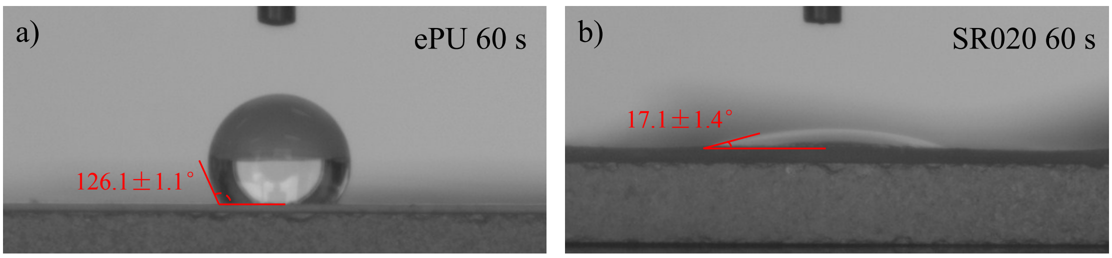

Figure S1. Contact angle images of ePU and SRgel after 60 s. a) Non-wetting contact on ePU. b) Wetting contact on SR020.

The hydrophilicity of the sample was evaluated by measuring the contact angle （GBX Digidrop DX) between the droplet and the sample surface. SR020 exhibits excellent hydrophilicity and contact angle reaches only 17.1±1.4° after 60 s due to the composite with SBMA hydrogel while the ePU lacks hydrophilicity and the contact angle reaches 126.1±1.1° (Fig.S1).

2) Swelling ratio of SRgel and mass ratio of SBMA to ePU.

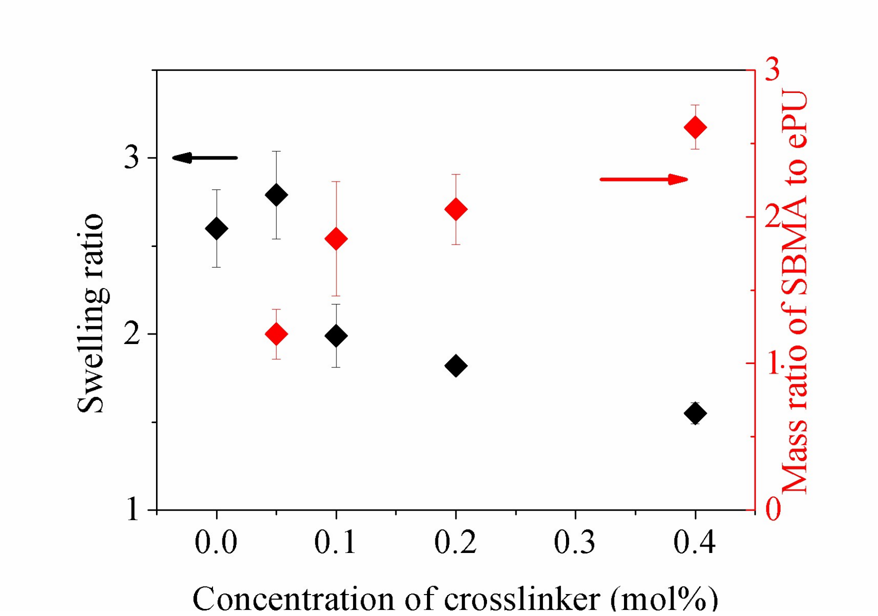

Figure S2. Swelling ratio of SRgel and mass ratio of SBMA to ePU. Sample ePU was showed as SRgel with 0.0 mol% concentration of crosslinker.

As a biomimetic material for blood-contact device, water content and mass ratio of two components are important. Among them, water content can be evaluated by swelling ratio (SR), which is calculated by

$$SR = \frac{W_{Swollen} - W_{dried}}{W_{dried}} \tag{1}$$

In which, $W_{swollen}$ is the weight of SRgel in water saturation after 3 days at 37℃ and W_{dried} is the weight of SRgel dehydrated by freeze-drying. Mass ratio of SBMA to ePU is calculated by

$$MR = \frac{W_{dried} - W_{ePU}}{W_{ePU}} \tag{2}$$

In which, W_{ePU} is the weight of dried ePU.

With the increase of crosslinker density, swelling ratio of SRgels decreased. Sample named SR005 showed slightly higher than ePU due to the incorporation of SBMA. Mass ratio of SBMA to ePU of SRgels increased with the crosslinker density, which were also shown in SEM images.

3) Definition and model of true tensile strain (TTS）.

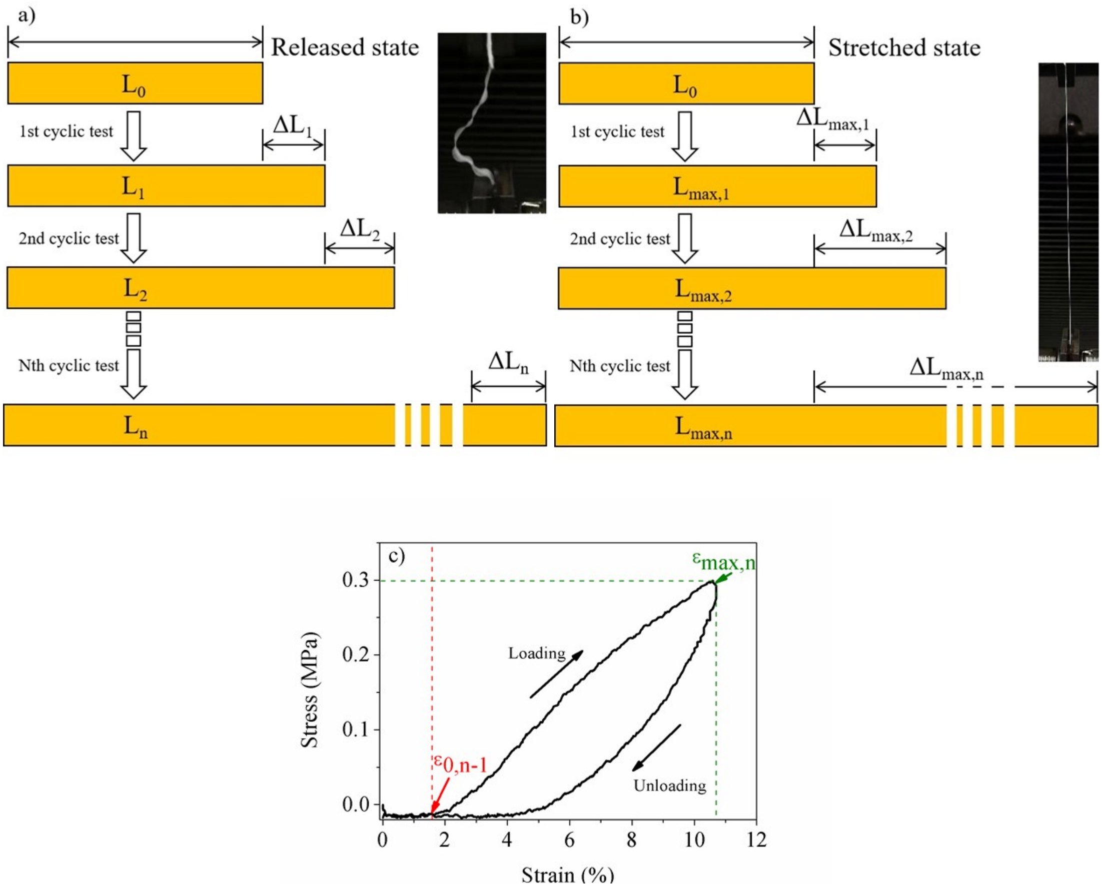

Figure S3. Schematic illustration of the definition of true tensile strain. a) Parameter illustration in released state. Parameter ΔL_n was defined as the elongation after the unloading process in each cyclic test. b) Parameter illustration in stretched state. Parameter ΔL was defined as the elongation under maximum tensile stress at set. c) Cyclic tensile curve of SR020 at 3.0 mm/mm strain. The residual strain ($\varepsilon_{0,n}$) and maximum tensile strain ($\varepsilon_{max,n}$) were extracted from the curve.

Since ePU is not a true elastomer, there is slightly elongation after each cycle. To reflect the real strain, we also defined residual strain ($\varepsilon_{0,n}$), maximum tensile strain ($\varepsilon_{max,n}$) and true tensile strain (TTS) (Fig.S3). Among them,

$$\varepsilon_{0,n} = \frac{L_n}{L_0} - 1 = \frac{L_{n-1} + \Delta L_n}{L_0} - 1 = \frac{\sum_{m=1}^{n} \Delta L_m}{L_0} \tag{3}$$

$$\varepsilon_{\max,n} = \frac{L_{\max,n}}{L_0} - 1 = \frac{\Delta L_{\max,n} + L_0}{L_0} - 1 = \frac{\Delta L_{\max,n}}{L_0} \tag{4}$$

In which, $\varepsilon_{0,\ n}$ is defined as residual strain after the n^{th} cycle and $\varepsilon_{max,\ n}$ is defined as maximum strain in n^{th} cycle. Both of them were extracted from cyclic curve shown in Figure S3. According these,

$$TTS_1 = \frac{L_{max,1}}{L_0} - 1 = \frac{\Delta L_{max,1}}{L_0} = \varepsilon_{max,1} \tag{5}$$

$$TTS_2 = \frac{L_{max,2}}{L_1} - 1 = \frac{L_0 + \Delta L_{max,2} - L_1}{L_1} = \frac{\frac{\Delta L_{max,2}}{L_0}}{\frac{\Delta L_1 + L_0}{L_0}} - \frac{\Delta L_1}{L_0 + \Delta L_1} = \frac{\varepsilon_{max,2} - \varepsilon_{0,1}}{\varepsilon_{0,1} + 1} \tag{6}$$

$$TTS_n = \frac{\varepsilon_{max,n} - \varepsilon_{0,n-1}}{\varepsilon_{0,n-1} + 1} \tag{7}$$

In which, TTS is defined to evaluate real tensile strain in n^{th} cycle based on actual length of SRgels after stretching n-1 times. The definition of TTS can be used to assess whether a sample can maintain sufficient deformation under cyclic stress conditions for long-term use as blood-contacting devices.

4) Fatigue test of SRgel under constant tensile stress.

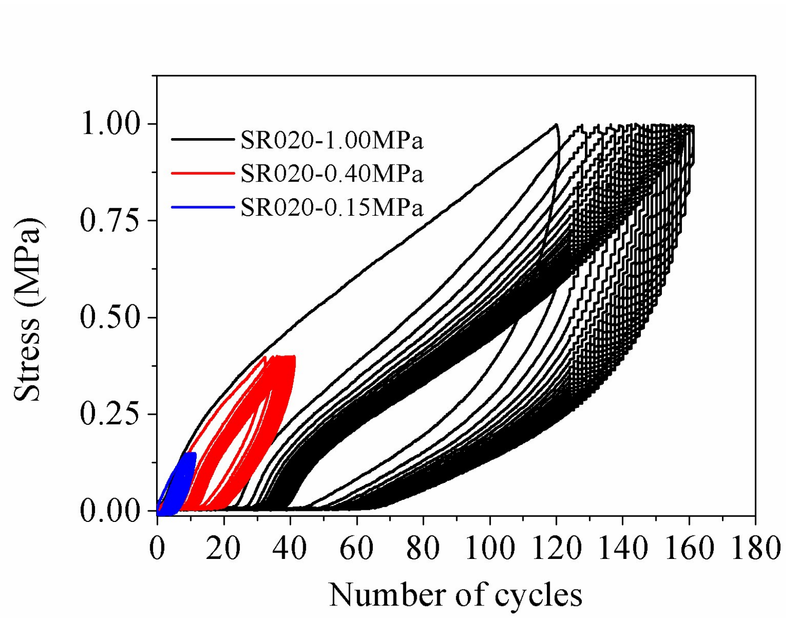

Figure S4. Cyclic tensile test by keeping stress at 0.15, 0.40, and 1.00 MPa of SR020, respectively.

The cyclic tensile curves of SR020 were further tested by keeping stress at 0.40 and 1.00MPa, respectively to evaluate mechanical fatigue after 30 times stretch. All the samples kept intact and the cyclic tensile curves showed no further changes within 20 times stretch.