High Ion Barrier Hydrogel with Excellent Toughness Achieved by Directional Structures

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13 Table S1. Light transmittance of PVA hydrogels prepared at different sodium citrate salting-out concentrations

Wave / SC concentration	425	450	485	550	590	600	700	Average value
No salting-out	89.95	90.42	91.00	91.92	92.41	92.51	93.29	91.64
0.5M	85.85	85.84	85.70	85.49	85.50	85.51	85.38	85.61
1.0M	88.82	89.00	89.03	88.97	88.98	88.98	88.71	88.93
1.5M	85.95	86.12	86.18	86.13	86.10	86.12	86.18	86.11
Saturated	83.05	83.25	83.27	83.25	83.27	83.23	83.14	83.21

Table S2. Light transmittance of PVA hydrogels prepared at different sodium citrate salting-out times

Wave / Time /h	425	450	485	550	590	600	700	Average value
No salting-out	89.95	90.42	91.00	91.92	92.41	92.51	93.29	91.64
3h	76.40	76.74	77.25	78.26	78.73	78.84	79.46	77.96
6h	80.15	80.25	80.32	80.36	80.38	80.40	80.30	80.31
12h	79.44	79.54	79.55	79.47	79.42	79.42	79.09	79.42
24h	83.06	83.23	83.28	83.31	83.30	83.28	83.05	83.21
48h	82.84	83.27	83.56	84.08	84.20	84.23	84.12	83.76

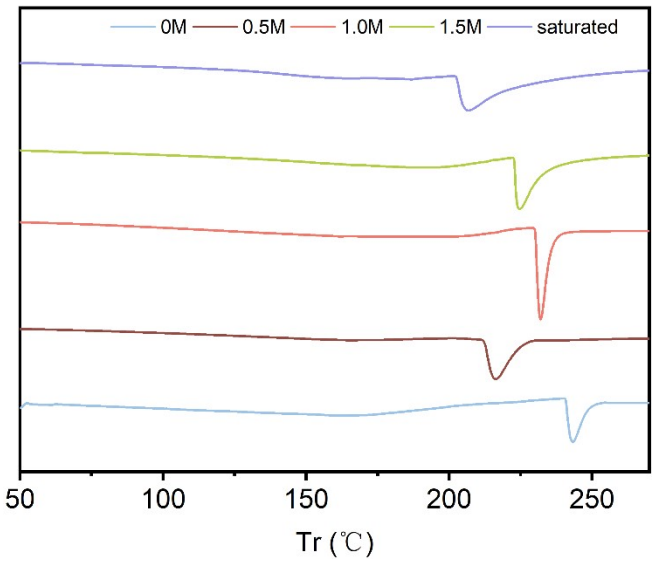

Fig S1 Heat flow curve of DFPVA prepared under various salting-out solution concentrations.

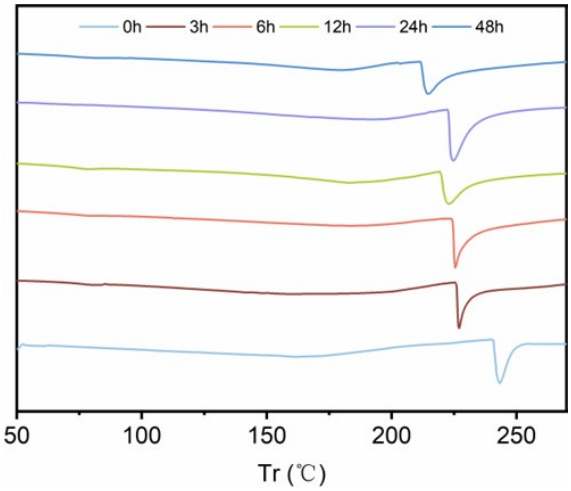

Fig S2 Heat flow curve of DFPVA prepared under various salting-out times.

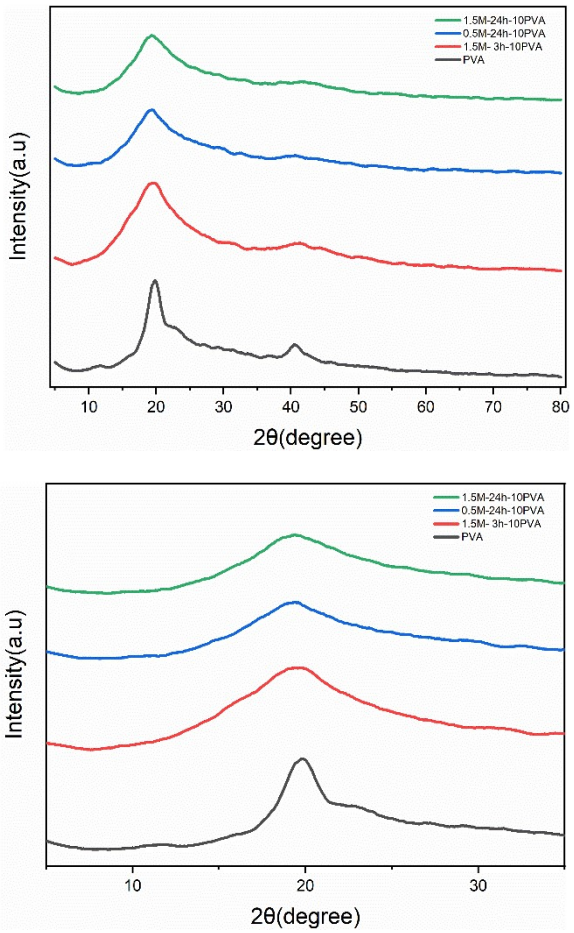

Fig S3 XRD of pure PVA, 0.5M salting-out for 24 h, 1.5M salting-out for 24 h, and 1.5 M salting-out for 3 h samples.

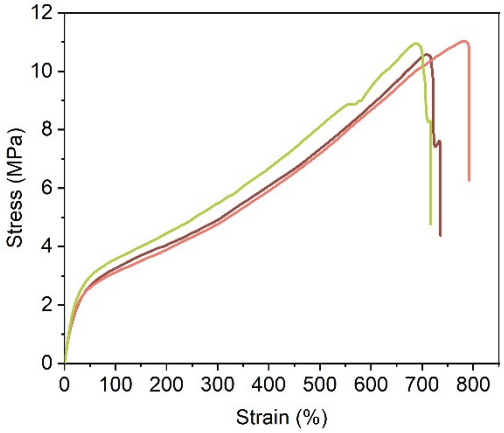

Fig. S4 Stress–strain curves of the DFPVA hydrogels after 24 h of salting out in saturated sodium citrate.

Error analysis:

Due to the loose internal structure of the gel and high initial water content, a large standard deviation appeared in the WVTR (Fig. 2c) within the first 24 h. Subsequently, the standard deviation fluctuations decreased, and the WVTR values tended to stabilize. Under low-intensity salting-out conditions (0.5 M sodium citrate, 3 h), the material density was too low, and the material was relatively soft and fragile. According to the Cl^- permeability data (Fig. 4b, c), the 0.5 M and 3 h samples also exhibited large standard deviations. As the sodium citrate concentration increased, the standard deviation decreased, and the data became more stable. Although relatively large standard deviations exist under certain conditions, the repeated experiments demonstrated overall reasonable repeatability of the data and conformance with the expected related patterns.