**Supporting Information**

# Mussel-inspired Strong and Tough Hydrogel with Self-adhesive based on Dynamic Interactions for Flexible Wearable Electronics

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**Table S1** Formulations of prepared PVA-DBA hydrogel.

| Sample | Comprise (g) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | PVA-DOPA | AM | PAA | MBA (0.1 wt.%) | $Fe(NO_3)_3$ | Irgacure 2959 | $H_2O$ | NaCl |
| PVA-DBA-0 | 0 | 0.2 | 0.1 | 0.6 | 0.048 | 0.01 | 0.4 | 0.01 |
| PVA-DBA-0.1 | 0.1 | 0.2 | 0.1 | 0.6 | 0.048 | 0.01 | 0.4 | 0.01 |
| PVA-DBA-0.2 | 0.2 | 0.2 | 0.1 | 0.6 | 0.048 | 0.01 | 0.4 | 0.01 |
| PVA-DBA-0.3 | 0.3 | 0.2 | 0.1 | 0.6 | 0.048 | 0.01 | 0.4 | 0.01 |
| PVA-DBA-0.4 | 0.4 | 0.2 | 0.1 | 0.6 | 0.048 | 0.01 | 0.4 | 0.01 |
| PVA-DBA-0@$Fe^{3+}$ | 0 | 0.2 | 0.1 | 0.6 | 0 | 0.01 | 0.4 | 0.01 |
| PVA-DBA-0.1@$Fe^{3+}$ | 0.1 | 0.2 | 0.1 | 0.6 | 0 | 0.01 | 0.4 | 0.01 |
| PVA-DBA-0.2@$Fe^{3+}$ | 0.2 | 0.2 | 0.1 | 0.6 | 0 | 0.01 | 0.4 | 0.01 |
| PVA-DBA-0.3@$Fe^{3+}$ | 0.3 | 0.2 | 0.1 | 0.6 | 0 | 0.01 | 0.4 | 0.01 |
| PVA-DBA-0.4@$Fe^{3+}$ | 0.4 | 0.2 | 0.1 | 0.6 | 0 | 0.01 | 0.4 | 0.01 |

**Table S2** Monomer conversion of the $=CH_2$ bond from PVA-DBA hydrogel as a function of UV irradiation time.

| UV irradiation time (min) | Monomer conversion (%) |
|---|---|
| 0 | 0 |
| 2 | 1.9 |
| 4 | 4.6 |
| 8 | 12.3 |
| 12 | 25.5 |
| 16 | 80.4 |
| 20 | 94.6 |

**Table S3** Mechanical properties of prepared PVA-DBA-x hydrogel.

| Sample | Mechanical properties | | | |
|---|---|---|---|---|
| | Maximum stress (kPa) | Maximum strain (%) | Toughness ($J/m^3$) | Young's modulus (kPa) |
| PVA-DBA-0 | 2.5 | 37 | 72.0 | 6.2 |
| PVA-DBA-0.1 | 16.9 | 221 | 1526.9 | 7.3 |
| PVA-DBA-0.2 | 14.7 | 144 | 1349.9 | 16.2 |
| PVA-DBA-0.3 | 19.7 | 145 | 1653.5 | 16.5 |
| PVA-DBA-0.4 | 28.7 | 148 | 2178.8 | 17.2 |

**Table S4** Mechanical properties of prepared PVA-DBA-x @$Fe^{3+}$ hydrogel.

| Sample | Mechanical properties | | | |
|---|---|---|---|---|
| | Maximum stress (kPa) | Maximum strain (%) | Toughness ($J/m^3$) | Young's modulus (kPa) |
| PVA-DBA-0@$Fe^{3+}$ | 19.3 | 33 | 413.7 | 10.2 |
| PVA-DBA-0.1@$Fe^{3+}$ | 30.2 | 125 | 2581.1 | 15.6 |
| PVA-DBA-0.2@$Fe^{3+}$ | 78.6 | 128 | 5156.8 | 20.4 |
| PVA-DBA-0.3@$Fe^{3+}$ | 92.8 | 101 | 4845.5 | 60.4 |
| PVA-DBA-0.4@$Fe^{3+}$ | 122.3 | 74 | 5938.1 | 151.1 |

**Table S5** Adhesion performance of PVA-DBA-x @$Fe^{3+}$ hydrogel for various substrates.

| Sample | Adhesive strength (kPa) | | | | |
|---|---|---|---|---|---|
| | Glass | Stainless steel | Aluminum | Porcine skin | PTFE |
| PVA-DBA-0@$Fe^{3+}$ | 50.6 | 56.5 | 53.8 | 12.3 | 13.0 |
| PVA-DBA-0.1@$Fe^{3+}$ | 75.5 | 68.0 | 57.4 | 44.5 | 18.8 |
| PVA-DBA-0.2@$Fe^{3+}$ | 87.5 | 77.0 | 70.3 | 63.0 | 31.4 |
| PVA-DBA-0.3@$Fe^{3+}$ | 60.3 | 54.6 | 42.1 | 35.4 | 18.9 |
| PVA-DBA-0.4@$Fe^{3+}$ | 40.7 | 26.8 | 26.5 | 24.5 | 13.7 |

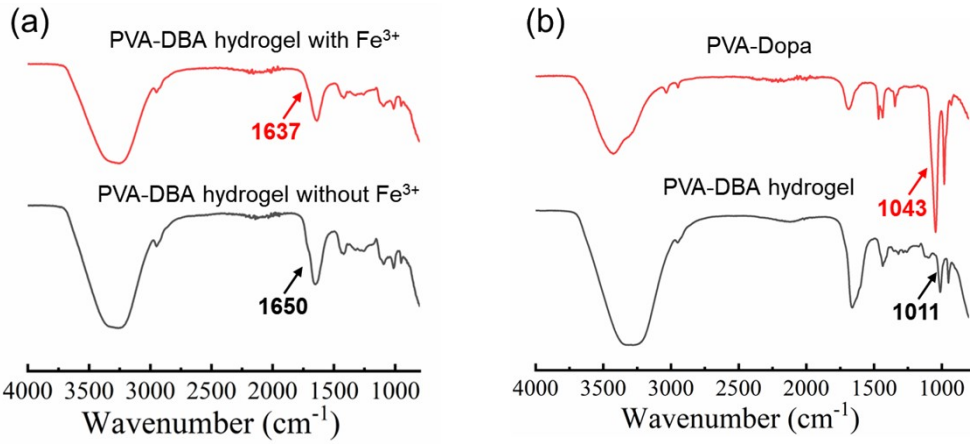


**Figure S1** Structure characterization of PVA-DBA hydrogels. a) PVA-DBA hydrogel with and without $Fe^{3+}$. b) FT-IR spectra of PVA-DOPA and PVA-DBA hydrogel with $Fe^{3+}$.