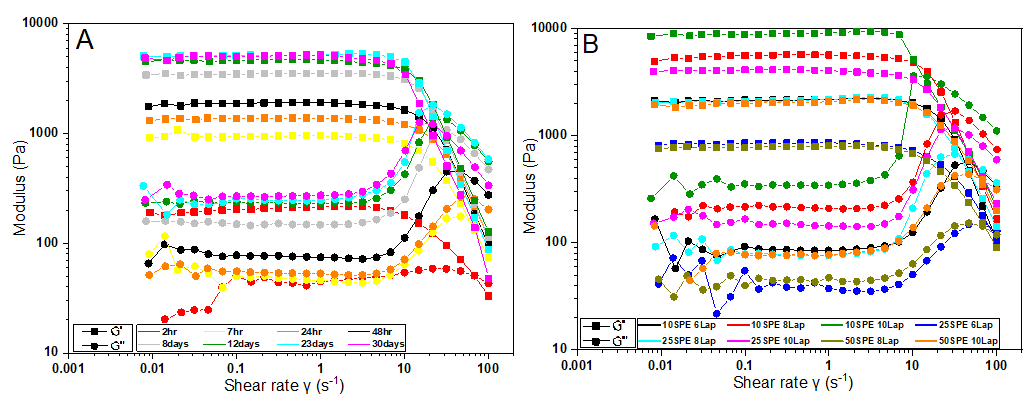
Supporting information

**The effect of print speed and material aging on the mechanical properties of a self-healing nanocomposite hydrogel**

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**Supplementary Figure 1:** Complete rheological data for A - different curing times and B - different compositions. G’ data represented using squares while G’’ is represented with circles.

**Supplementary Table 1:** Yield point for different compositions of the rheological data recorded (where G'=G''). Increasing the Laponite resulted in higher yield points while increase in monomer showed the reverse.

|  |  |  |
| --- | --- | --- |
| **Composition** | **τ0 (Pa)** | **(s-1)** |
| 10 wt.% SPE 6 wt.% Laponite | 557.2 | 41.8 |
| 10 wt.% SPE 8 wt.% Laponite | 1630.1 | 28.3 |
| 10 wt.% SPE 10 wt.% Laponite | 3579.3 | 13.0 |
| 25 wt.% SPE 6 wt.% Laponite | 140.9 | 81.1 |
| 25 wt.% SPE 8 wt.% Laponite | 645.2 | 35.9 |
| 25 wt.% SPE 10 wt.% Laponite | 1153.6 | 32.1 |
| 50 wt.% SPE 8 wt.% Laponite | 145.5 | 69.6 |
| 50 wt.% SPE 10 wt.% Laponite | 390.5 | 64.7 |

**Supplementary Table 2:** Yield point for different aging times recorded (where G'=G'') for 10wt% 6wt% Laponite composition. An increase in aging time showed and increased yield point.

|  |  |  |
| --- | --- | --- |
| **Aging time** | **τ0 (Pa)** | **(s-1)** |
| **2 hr** | 50.6 | 68.3 |
| **7 hr** | 159.9 | 60.8 |
| **24 hr** | 255.2 | 59.2 |
| **48 hr** | 557.2 | 41.8 |
| **8 days** | 1045.5 | 28.5 |
| **12 days** | 1344.6 | 25.9 |
| **23 days** | 1735.0 | 19.6 |
| **30 days** | 1231.9 | 18.5 |

**Supplementary Table 3:** Tensile data of samples printed at different speeds that were either cured during printing (CDP) or only post cured (PC) at different aging times compared to cast samples.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Printing speed**  **mm/s** | **Aging (days)** | **Curing**  **(CDP or PC)** | **Stress at failure (kPa)** | **UTS (kPa)** | **Strain at failure (%)** | **Young’s modulus (kPa)** |
| **5** | 2 | CDP | 8.76 ± 2.69 | 32.4 ± 6.91 | 284.1 ± 111.2 | 0.764 ± 0.130 |
| **10** | 2 | CDP | 28.8 ± 3.3 | 31.4 ± 8.9 | 762.3 ± 120.4 | 0.945 ± 0.198 |
| **10** | 2 | PC | 20.8 ± 2.5 | 28.2 ± 2.5 | 105.3 ± 34.4 | 1.188 ± 0.230 |
| **20** | 2 | CDP | 21.0 ± 4.0 | 25.8 ± 4.0 | 119.6 ± 25.1 | 0.690 ± 0.068 |
| **20** | 0.2 | PC | 15.0 ± 1.1 | 20.0 ± 3.5 | 119.8 ± 19.3 | 0.862 ± 0.227 |
| **20** | 2 | PC | 16.7 ± 2.11 | 25.6 ± 2.5 | 91.9 ± 15.0 | 1.362 ± 0.174 |
| **20** | 12 | PC | 10.1 ± 2.3 | 19.5 ± 3.9 | 38.0 ± 3.9 | 1.141 ± 0.111 |
| **30** | 2 | CDP | 15.2 ± 4.7 | 23.0 ± 2.0 | 130.7 ± 14.6 | 0.680 ± 0.067 |
| **0 (cast)** | 0 | PC | 34.4 ± 7.49 | 35.1 ± 5.66 | 898.3 ± 248.8 | 0.164 ± 0.004 |
| **0 (cast)** | 2 | PC | 28.7 ± 6.3 | 32.7 ± 4.2 | 239.7 ± 51.2 | 0.737 ± 0.008 |



**Supplementary Figure 2:** Effect of curing time on strain at failure. Graph shows that lower curing time resulted in higher strain at failure.



**Supplementary Figure 3:** Effect of curing intensity during printing on tensile properties.Lower intensity samples displayed slightly reducedstrain at failure and a significant decrease was seen for the samples which were not cured during printing.



**Supplementary Figure 4:** Effect of aging on tensile properties (samples printed at 20mm/s with only postcuring). A – 5-9 hr aged, B – 48hr aged and C – 12 days aged.



**Supplementary Figure 5:** Effect of printing speed on tensile properties. A – 5mm/s, B –10mm/s, C – 20mm/s and D – 30mm/s (samples were cured during printing).



**Supplementary Figure 6:** Comparison of printed samples (20mm/s) which has been A – postcured only and B – cured during printing.



**Supplementary Figure 7:** Comparison of printed samples (20mm/s) and cast samples which were aged for 48hr.

**Supplementary Table 4:** Combined data of compression tests of all variables. (CDP-Cured During Printing, PC-Postured).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Printing speed**  **(mm/s)** | **Age time (Days)** | **Curing** | **Maximum load (N)** | **Maximum stress (kPa)** | **Maximum strain (%)** | **Compression**  **modulus (kPa)** |
| **10** | 2 | CDP | 29.1± 1.3 | 47.3 ± 2.1 | 80 | 0.205 ± 0.008 |
| **20** | 2 | CDP | 40.2 ± 5.1 | 65.2 ± 8.3 | 80 | 0.229 ± 0.009 |
| **20** | 2 | PC | 47.7 ± 1.4 | 76.5 ± 2.3 | 80 | 0.257 ± 0.004 |
| **20** | 12 | CDP | 54.8 ± 3.7 | 89.0 ± 6.0 | 80 | 0.314 ± 0.025 |
| **20** | 12 | PC | 53.9 ± 4.5 | 87.4 ± 7.4 | 80 | 0.335 ± 0.031 |
| **30** | 2 | CDP | 41.9 ± 2.7 | 68.11 ± 4.4 | 80 | 0.245 ± 0.002 |
| **0 (Cast)** | 0 | PC | 17.0 ± 1.6 | 27.5 ± 2.6 | 80 | 0.107 ± 0.028 |
| **0 (Cast)** | 2 | PC | 43.6 ± 2.1 | 70.9 ± 3.5 | 80 | 0.298 ± 0.013 |