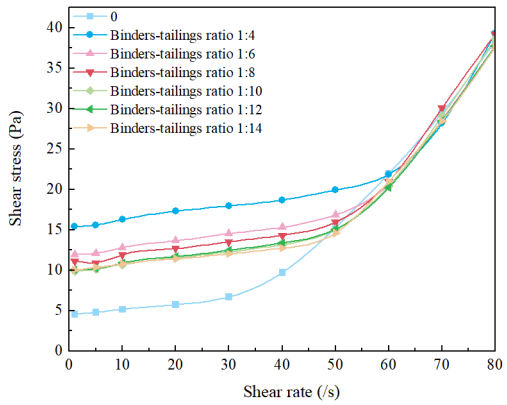
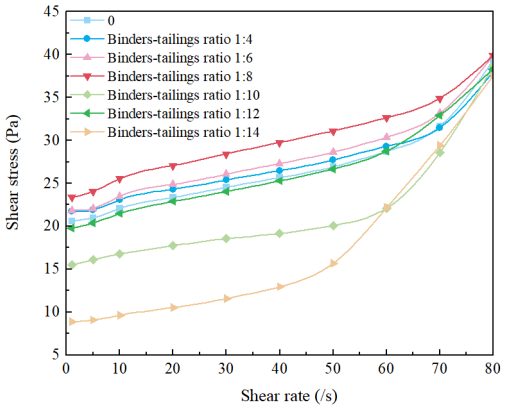
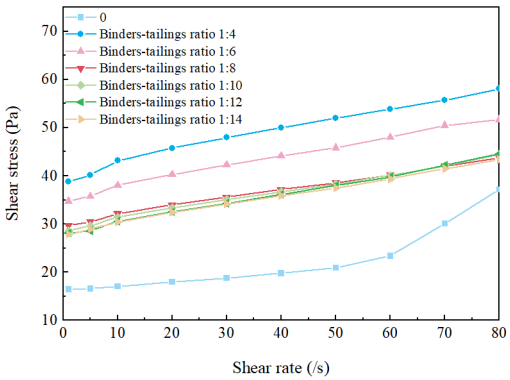
**Supplementary material**



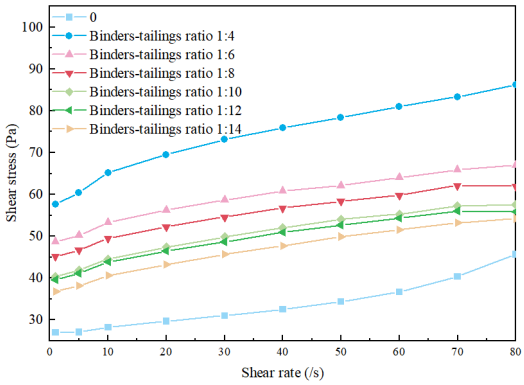

(a) underflow concentration 49.24%



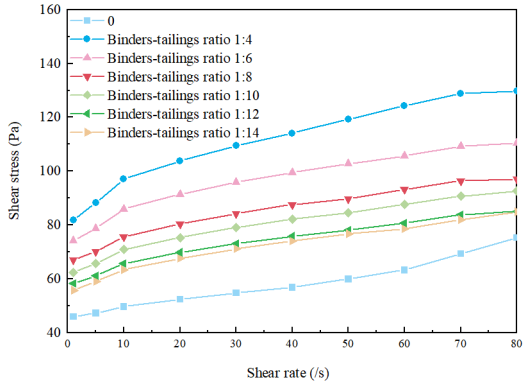

(b) underflow concentration 51.42%




(c) underflow concentration 53.6%

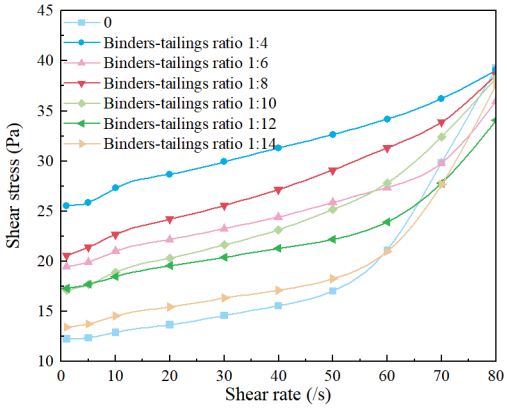



(d) underflow concentration 55.78%

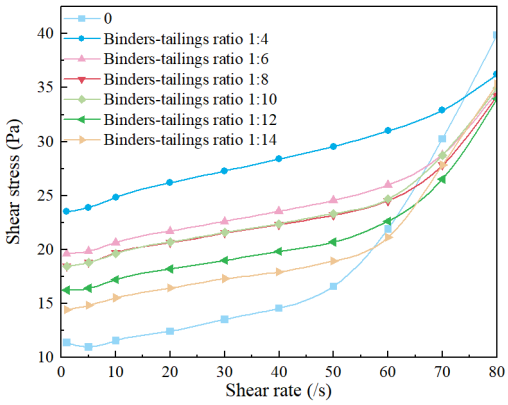



(e) underflow concentration 57.96%

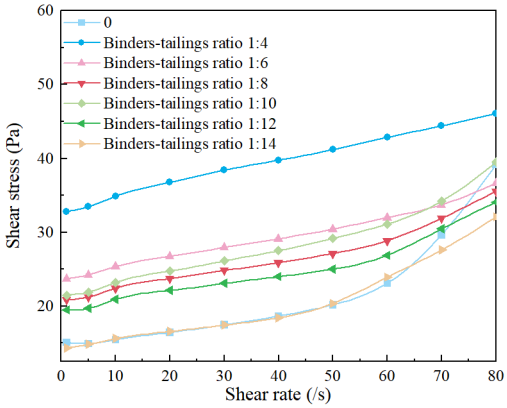
**Figure S1**. The flow curve of the filling slurry with a fine-to-coarse tailings ratio of 9:1



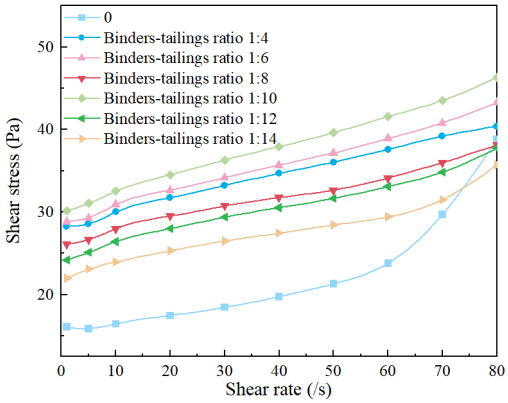

(a) underflow concentration 48.43%



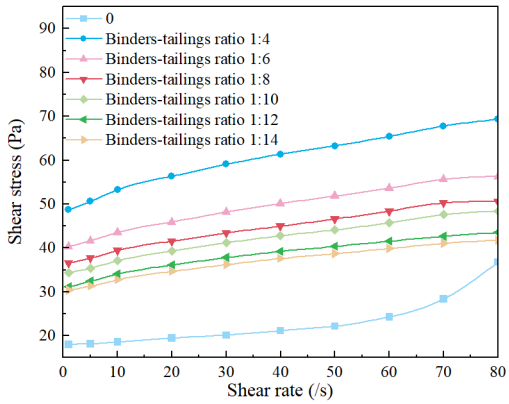

(b) underflow concentration 49.89%




(c) underflow concentration 51.35%

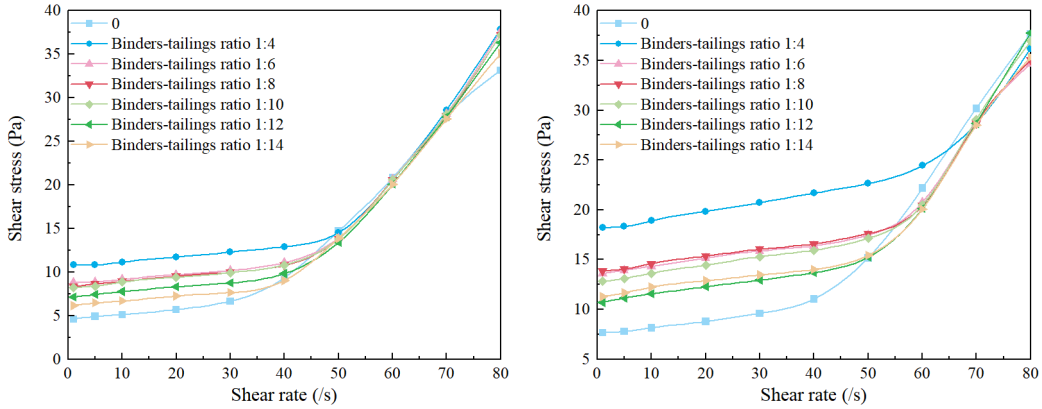



(d) underflow concentration 52.81%

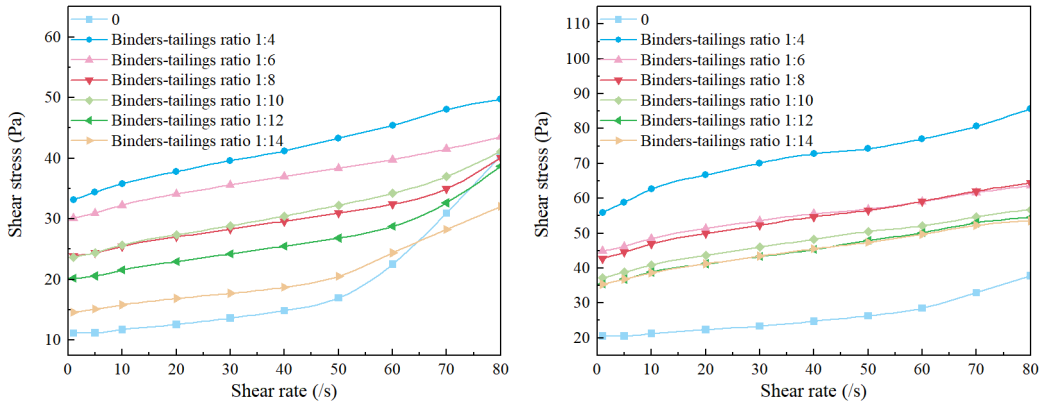



(e) underflow concentration 54.27%

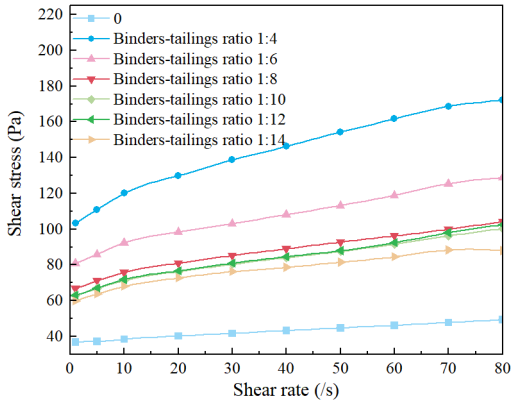
**Figure S2**. The flow curve of the filling slurry with a fine-to-coarse tailings ratio of 10:1




(a) underflow concentration 45.72% (b) underflow concentration 48.74%




(c) underflow concentration 51.76% (d) underflow concentration 54.78%




(e) underflow concentration 57.8%

**Figure S3**. The flow curve of the filling slurry with a fine-to-coarse tailings ratio of 11:1

**Table S1**. Results of rheological experiment on Paste

| Fine-coarse tailings ratio | Underflow concentration (%) | Binder-tailings ratio | Static yield stress (Pa) | Dynamic yield stress (Pa) |
|---|---|---|---|---|
| 9 | 49.24 | 1: 4 | 16.74 | 16.67 |
| 9 | 49.24 | 1: 6 | 14.67 | 12.83 |
| 9 | 49.24 | 1: 8 | 12.09 | 11.74 |

| | | | | |
|---|---|---|---|---|
| 9 | 49.24 | 1: 10 | 11.83 | 10.61 |
| 9 | 49.24 | 1:12 | 12.39 | 10.78 |
| 9 | 49.24 | 1:14 | 11.55 | 10.27 |
| 9 | 49.24 | 0 | 6.18 | 4.53 |
| 9 | 51.42 | 1: 4 | 22.62 | 21.94 |
| 9 | 51.42 | 1: 6 | 22.99 | 22.70 |
| 9 | 51.42 | 1: 8 | 23.78 | 22.90 |
| 9 | 51.42 | 1: 10 | 25.38 | 24.19 |
| 9 | 51.42 | 1:12 | 24.77 | 19.89 |
| 9 | 51.42 | 1:14 | 22.41 | 20.14 |
| 9 | 51.42 | 0 | 15.747 | 9.34 |
| 9 | 53.60 | 1: 4 | 45.30 | 37.67 |
| 9 | 53.60 | 1: 6 | 37.43 | 34.29 |
| 9 | 53.60 | 1: 8 | 29.76 | 29.42 |
| 9 | 53.60 | 1: 10 | 30.26 | 28.47 |
| 9 | 53.60 | 1:12 | 30.87 | 27.92 |
| 9 | 53.60 | 1:14 | 28.23 | 27.74 |
| 9 | 53.60 | 0 | 18.818 | 17.25 |
| 9 | 55.78 | 1: 4 | 71.83 | 54.51 |
| 9 | 55.78 | 1: 6 | 51.20 | 46.52 |
| 9 | 55.78 | 1: 8 | 45.40 | 42.86 |
| 9 | 55.78 | 1: 10 | 41.69 | 38.10 |
| 9 | 55.78 | 1:12 | 40.55 | 37.45 |
| 9 | 55.78 | 1:14 | 40.19 | 35.26 |
| 9 | 55.78 | 0 | 27.923 | 27.61 |
| 9 | 57.96 | 1: 4 | 105.45 | 74.77 |
| 9 | 57.96 | 1: 6 | 91.51 | 67.07 |
| 9 | 57.96 | 1: 8 | 77.56 | 62.69 |
| 9 | 57.96 | 1: 10 | 74.71 | 58.61 |
| 9 | 57.96 | 1:12 | 67.20 | 55.13 |
| 9 | 57.96 | 1:14 | 66.55 | 53.09 |
| 9 | 57.96 | 0 | 50.34 | 47.35 |
| 10 | 48.43 | 1: 4 | 26.749 | 25.78 |
| 10 | 48.43 | 1: 6 | 19.978 | 19.93 |
| 10 | 48.43 | 1: 8 | 22.453 | 20.97 |
| 10 | 48.43 | 1: 10 | 20.435 | 17.55 |
| 10 | 48.43 | 1:12 | 19.208 | 17.72 |
| 10 | 48.43 | 1:14 | 14.204 | 13.87 |
| 10 | 48.43 | 0 | 12.933 | 12.43 |
| 10 | 49.89 | 1: 4 | 26.966 | 23.69 |
| 10 | 49.89 | 1: 6 | 22.333 | 19.96 |
| 10 | 49.89 | 1: 8 | 22.108 | 18.90 |
| 10 | 49.89 | 1: 10 | 20.662 | 18.86 |
| 10 | 49.89 | 1:12 | 18.252 | 16.47 |

| | | | | |
|---|---|---|---|---|
| 10 | 49.89 | 1:14 | 16.835 | 14.88 |
| 10 | 49.89 | 0 | 14.801 | 11.17 |
| 10 | 51.35 | 1: 4 | 32.765 | 32.74 |
| 10 | 51.35 | 1: 6 | 26.387 | 23.90 |
| 10 | 51.35 | 1: 8 | 23.191 | 21.14 |
| 10 | 51.35 | 1: 10 | 21.918 | 21.83 |
| 10 | 51.35 | 1:12 | 21.657 | 19.80 |
| 10 | 51.35 | 1:14 | 19.118 | 14.72 |
| 10 | 51.35 | 0 | 15.639 | 15.13 |
| 10 | 52.81 | 1: 4 | 32.521 | 27.99 |
| 10 | 52.81 | 1: 6 | 29.715 | 28.84 |
| 10 | 52.81 | 1: 8 | 30.305 | 26.21 |
| 10 | 52.81 | 1: 10 | 30.531 | 29.91 |
| 10 | 52.81 | 1:12 | 26.651 | 24.08 |
| 10 | 52.81 | 1:14 | 23.617 | 22.15 |
| 10 | 52.81 | 0 | 17.355 | 16.09 |
| 10 | 54.27 | 1: 4 | 57.101 | 47.56 |
| 10 | 54.27 | 1: 6 | 43.227 | 39.58 |
| 10 | 54.27 | 1: 8 | 37.532 | 35.82 |
| 10 | 54.27 | 1: 10 | 35.048 | 33.71 |
| 10 | 54.27 | 1:12 | 35.449 | 30.25 |
| 10 | 54.27 | 1:14 | 32.906 | 29.69 |
| 10 | 54.27 | 0 | 20.706 | 18.25 |
| 11 | 45.72 | 1: 4 | 11.328 | 11.05 |
| 11 | 45.72 | 1: 6 | 10.444 | 8.91 |
| 11 | 45.72 | 1: 8 | 8.892 | 8.63 |
| 11 | 45.72 | 1: 10 | 9.111 | 8.50 |
| 11 | 45.72 | 1:12 | 7.622 | 7.34 |
| 11 | 45.72 | 1:14 | 7.009 | 6.20 |
| 11 | 45.72 | 0 | 5.48 | 4.42 |
| 11 | 48.74 | 1: 4 | 19.132 | 19.49 |
| 11 | 48.74 | 1: 6 | 15.431 | 14.52 |
| 11 | 48.74 | 1: 8 | 16.296 | 14.78 |
| 11 | 48.74 | 1: 10 | 14.438 | 13.90 |
| 11 | 48.74 | 1:12 | 12.725 | 11.66 |
| 11 | 48.74 | 1:14 | 13.144 | 12.16 |
| 11 | 48.74 | 0 | 9.783 | 7.71 |
| 11 | 51.76 | 1: 4 | 36.273 | 33.28 |
| 11 | 51.76 | 1: 6 | 30.66 | 29.99 |
| 11 | 51.76 | 1: 8 | 24.848 | 24.66 |
| 11 | 51.76 | 1: 10 | 24.804 | 24.31 |
| 11 | 51.76 | 1:12 | 21.643 | 21.23 |
| 11 | 51.76 | 1:14 | 19.755 | 15.29 |
| 11 | 51.76 | 0 | 12.552 | 11.68 |

| | | | | |
|---|---|---|---|---|
| 11 | 54.78 | 1: 4 | 72.163 | 55.08 |
| 11 | 54.78 | 1: 6 | 50.615 | 44.29 |
| 11 | 54.78 | 1: 8 | 48.291 | 42.23 |
| 11 | 54.78 | 1: 10 | 42.705 | 36.57 |
| 11 | 54.78 | 1:12 | 40.62 | 35.22 |
| 11 | 54.78 | 1:14 | 40.4 | 34.87 |
| 11 | 54.78 | 0 | 22.549 | 21.07 |
| 11 | 57.8 | 1: 4 | 147.945 | 97.99 |
| 11 | 57.8 | 1: 6 | 106.474 | 79.60 |
| 11 | 57.8 | 1: 8 | 86.002 | 64.81 |
| 11 | 57.8 | 1: 10 | 82.039 | 62.03 |
| 11 | 57.8 | 1:12 | 81.952 | 62.44 |
| 11 | 57.8 | 1:14 | 72.6025 | 56.04 |
| 11 | 57.8 | 0 | 40.594 | 36.44 |
| 12 | 46.04 | 1: 4 | 10.761 | 9.93 |
| 12 | 46.04 | 1: 6 | 10.07 | 9.30 |
| 12 | 46.04 | 1: 8 | 8.709 | 6.61 |
| 12 | 46.04 | 1: 10 | 7.762 | 6.06 |
| 12 | 46.04 | 1:12 | 8.598 | 5.94 |
| 12 | 46.04 | 1:14 | 8.206 | 4.99 |
| 12 | 46.04 | 0 | 6.694 | 2.47 |
| 12 | 48.59 | 1: 4 | 16.294 | 15.72 |
| 12 | 48.59 | 1: 6 | 13.061 | 12.63 |
| 12 | 48.59 | 1: 8 | 11.137 | 9.64 |
| 12 | 48.59 | 1: 10 | 9.602 | 7.98 |
| 12 | 48.59 | 1:12 | 13.056 | 9.77 |
| 12 | 48.59 | 1:14 | 9.499 | 8.39 |
| 12 | 48.59 | 0 | 8.679 | 6.38 |
| 12 | 51.14 | 1: 4 | 25.811 | 24.92 |
| 12 | 51.14 | 1: 6 | 25.541 | 23.63 |
| 12 | 51.14 | 1: 8 | 22.864 | 19.60 |
| 12 | 51.14 | 1: 10 | 22.602 | 21.22 |
| 12 | 51.14 | 1:12 | 20.343 | 20.11 |
| 12 | 51.14 | 1:14 | 20.361 | 20.20 |
| 12 | 51.14 | 0 | 9.822 | 7.18 |
| 12 | 53.69 | 1: 4 | 51.775 | 44.34 |
| 12 | 53.69 | 1: 6 | 36.41 | 34.68 |
| 12 | 53.69 | 1: 8 | 35.212 | 33.17 |
| 12 | 53.69 | 1: 10 | 36.138 | 30.23 |
| 12 | 53.69 | 1:12 | 34 | 29.19 |
| 12 | 53.69 | 1:14 | 33.375 | 31.97 |
| 12 | 53.69 | 0 | 18.566 | 17.25 |
| 12 | 53.24 | 1: 4 | 93.379 | 68.58 |
| 12 | 56.24 | 1: 6 | 74.178 | 58.91 |

| | | | | |
|---|---|---|---|---|
| 12 | 56.24 | 1: 8 | 66.125 | 54.83 |
| 12 | 56.24 | 1: 10 | 61.505 | 53.42 |
| 12 | 56.24 | 1:12 | 52.839 | 45.89 |
| 12 | 56.24 | 1:14 | 49.535 | 39.12 |
| 12 | 56.24 | 0 | 32.657 | 29.46 |