**Table S1** Experimental program and test plan.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Indiana limestone | Scioto sandstone | Grey Berea sandstone | Tennessee sandstone |
| Load control | 18 (25.4 mm) | 24 (25.4 mm) | 23 (25.4 mm) | 13 (25.4 mm) |
| Axial displacement control |  | 11 (50.8 mm) |  |  |
| Lateral displacement (damage) control | 4 (25.4 mm) | 11 (25.4 mm) | 12 (25.4 mm) | 14 (50.8 mm) |

**Table S2.** Results of triaxial Brazilian test of Indiana limestone (load control).

|  |  |  |  |
| --- | --- | --- | --- |
| Pc=σ2(MPa) | Failure strength(MPa) |  σ3 (MPa) |  σ1 (MPa) |
| 0 | 6.4 | -6.4 | 19.3 |
| 2 | 9.6 | -7.6 | 30.7 |
| 4 | 11.3 | -7.3 | 37.9 |
| 6 | 12.5 | -6.5 | 43.5 |
| 10 | 14.9 | -4.9 | 54.7 |
| 14 | 16.9 | -2.9 | 64.6 |
| 18 | 18.8 | -0.8 | 74.4 |
| 26 | 20.2 | 5.8 | 86.7 |
| 40 | 22.0 | 18.0 | 106.0 |

**Table S3.** Results of triaxial Brazilian test of Scioto sandstone (load control).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pc=σ2(MPa) | Failure strength(MPa) | σ3(MPa) | σ1(MPa) | Fracture angle(degree) | Fracture morphology |
| 0 | 5.7 | -5.7 | 17.0 | 0 | Extension |
| 5 | 12.8 | -7.8 | 43.5 | n/a | Extension |
| 10 | 18.2 | -8.2 | 64.6 | 5.8 | Hybrid |
| 20 | 25.0 | -5.0 | 95.0 | 9.2 | Hybrid |
| 30 | 33.6 | -3.6 | 130.9 | 9.0 | Hybrid |
| 40 | 39.5 | 0.5 | 158.5 | 10.4 | Shear |
| 50 | 45.1 | 4.9 | 185.2 | 11.4 | Shear |
| 60 | 51.3 | 8.7 | 213.8 | 11.2 | Shear |
| 70 | 55.6 | 14.4 | 236.9 | 14.6 | Shear |
| 80 | 62.0 | 18.0 | 266.1 | 12.5 | Shear |
| 90 | 67.1 | 22.8 | 291.4 | 14.3 | Shear |
| 100 | 68.2 | 31.8 | 304.7 | 13.0 | Shear |

**Table S4.** Results of triaxial Brazilian test of Grey Berea sandstone (load control).

|  |  |  |  |
| --- | --- | --- | --- |
| Pc=σ2(MPa) | Failure strength(MPa) | σ3(MPa) | σ1(MPa) |
|  0 | 3.02 | -3.02 | 9.06 |
| 2 | 11.16 | -9.16 | 35.47 |
| 4 | 15.21 | -11.21 | 49.62 |
| 6 | 15.28 | -9.28 | 51.84 |
| 8 | 19.70 | -11.70 | 67.09 |
| 10 | 19.93 | -9.93 | 69.78 |
| 12 | 20.27 | -8.27 | 72.81 |
| 14 | 19.14 | -5.14 | 71.42 |
| 16 | 21.57 | -5.57 | 80.72 |
| 18 | 21.75 | -3.75 | 83.24 |
| 20 | 23.58 | -3.58 | 90.74 |
| 22 | 26.87 | -4.87 | 102.62 |
| 24 | 26.24 | -2.24 | 102.73 |
| 26 | 28.23 | -2.23 | 110.69 |
| 28 | 29.44 | -1.44 | 116.33 |
| 30 | 30.73 | -0.73 | 122.18 |
| 40 | 35.20 | 4.80 | 145.60 |
| 50 | 43.17 | 6.83 | 179.51 |
| 60 | 45.91 | 14.09 | 197.74 |
| 70 | 48.08 | 21.92 | 214.23 |
| 80 | 54.13 | 25.87 | 242.40 |
| 90 | 54.55 | 35.45 | 253.66 |
| 100 | 58.27 | 41.73 | 274.82 |

**Table S5.** Results of triaxial Brazilian test of Tennessee sandstone (load control).

|  |  |  |  |
| --- | --- | --- | --- |
| Pc=σ2(MPa) | Failure strength(MPa) | σ3(MPa) | σ1(MPa) |
| 0 | 11.5 | -11.5 | 34.6 |
| 10 | 25.6 | -15.6 | 86.9 |
| 15 | 32.1 | -17.1 | 111.4 |
| 20 | 37.8 | -17.8 | 133.7 |
| 30 | 47.9 | -17.9 | 173.9 |
| 40 | 59.7 | -19.7 | 219.3 |
| 50 | 68.1 | -18.1 | 254.4 |
| 60 | 79.9 | -19.9 | 299.9 |
| 70 | 89.6 | -19.6 | 338.8 |
| 80 | 101.2 | -21.2 | 383.7 |
| 90 | 112.1 | -22.1 | 426.2 |
| 100 | 120.4 | -20.4 | 461.3 |
| 110 | 129.6 | -19.6 | 498.7 |

**Table S6.** Results of triaxial Brazilian test of Tennessee sandstone (damage control).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Pc=σ2(MPa) | Failure strength(MPa) | σ3(MPa) | σ1(MPa) | Fracture angle(degree) | Fracture morphology |
| 0 | 12.2 | -12.2 | 36.7 | 0 | Extension |
| 10 | 27.5 | -17.5 | 92.4 | 0 | Extension |
| 20 | 37.0 | -17.0 | 130.9 | 0 | Extension |
| 30 | 45.2 | -15.2 | 165.7 | 0 | Extension |
| 40 | 56.3 | -16.3 | 208.8 | 4.3 | Hybrid |
| 50 | 65.5 | -15.5 | 246.5 | 5.9 | Hybrid |
| 60 | 76.0 | -16.0 | 287.9 | 4.8 | Hybrid |
| 70 | 82.4 | -12.4 | 317.3 | 8.2 | Hybrid |
| 80 | 98.5 | -18.5 | 375.5 | 8.9 | Hybrid |
| 90 | 103.7 | -13.7 | 401.0 | 4.2 | Hybrid |
| 100 | 109.7 | -9.7 | 429.1 | 9.9 | Hybrid |
| 110 | 122.0 | -12.0 | 476.0 | 10.2 | Hybrid |
| 120 | 127.9 | -7.9 | 503.6 | 11.2 | Hybrid |
| 130 | 135.6 | -5.6 | 536.9 | 11.3 | Hybrid |
| 137.9 | 136.7 | 1.2 | 555.2 | 13.1 | Shear |