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**Supplemental Table 1. Thickness of deformation bands under different shear displacement conditions.**

Please refer to Supplemental Table 1.2.5.6.xlsx

**Supplemental Table 2. Particle diameter of host rock and deformation bands under different shear displacement conditions.**

Please refer to in Supplemental Table 1.2.5.6.xlsx

**Supplemental Table 3. Host rock porosity extracted by nano-CT electron scanning under different shear displacement conditions.**

| Experiment Number and Experimental Conditions | Sample Number | Porosity of Host Rock on the Left |       |       | Porosity of Host Rock on the Right |       |       |
|---|---------------|-----------------------------------|-------|-------|------------------------------------|-------|-------|
|   |               | NO.1                              | NO.2  | NO.3  | NO.4                               | NO.5  | NO.6  |
| RS-1<br>2 Mpa 30°                             | Ub3Db1        | 27.38                             | 28.5  | 27.72 | 27.82                              | 28.54 | /     |
|   | Uc5Dc3        | 28.47                             | 28.89 | 27.99 | 29.16                              | 27.82 | /     |
| RS-2<br>2 Mpa 60°                             | Uc2Db4        | 30.55                             | 28.21 | /     | 29.38                              | 28.94 | 29.19 |
|   | Ua3Dd4        | 27.73                             | 27.46 | 27.18 | 27.72                              | 27.62 | 27.09 |
| RS-3<br>2 Mpa 90°                             | Uc5Db5        | 28.93                             | 28.35 | 29.47 | 28.72                              | 29.08 | 28.3  |
|   | Ud3Dc3        | 28.27                             | 28.43 | 28.5  | 28.4                               | 28.63 | /     |
| RS-4<br>2 Mpa 120°                            | Ua5Dd2        | 28.17                             | 28.86 | /     | 28.49                              | 27.54 | 28.88 |
|   | Uc5Db3        | 29.1                              | 27.33 | 25.4  | 27.46                              | 25.07 | 27.96 |
| RS-5<br>2 Mpa 150°                            | Ub2Dd4        | 28.39                             | 28.95 | /     | 28.16                              | 28.52 | 28.83 |
|   | Uc2Da4        | 27.51                             | 28.66 | 27.53 | 27.07                              | 26.97 | /     |
| RS-6<br>2 Mpa 190°                            | Ua3Dc2        | 28.05                             | 26.77 | 26.33 | 27.1                               | 27.23 | /     |
|   | Ub5Dd3        | 28.27                             | 28.93 | 28.37 | 27.91                              | 28.5  | /     |

**Supplemental Table 4. Porosity extracted of deformation bands by nano-CT electron scanning under different shear displacement conditions.**

| Experiment Number and Experimental Conditions | Sample Number | Porosity of Deformation Bands |      |      |      |      |      |      |
|---|---------------|-------------------------------|------|------|------|------|------|------|
|   |               | No.1                          | No.2 | No.3 | No.4 | No.5 | No.6 | No.7 |
| RS-1<br>2 Mpa 30°                             | Ub3Db1        | 8.45                          | 8.76 | 8.88 | 8.42 | /    | /    | /    |
|   | Uc5Dc3        | 8.78                          | 8.24 | 8.49 | 8.43 | /    | /    | /    |

|                       |        |      |      |      |      |      |      |      |
|-----------------------|--------|------|------|------|------|------|------|------|
| RS-2<br>2 Mpa 60°     | Uc2Db4 | 8.78 | 8.33 | 7.93 | 8.3  | 8.18 | /    | /    |
|                       | Ua3Dd4 | 8.43 | 8.44 | 8.19 | 8.68 | 8.26 | 8.49 | 8.57 |
| RS-3<br>2 Mpa 90°     | Uc5Db5 | 8.82 | 9.04 | 8.69 | 8.79 | 8.79 | /    | /    |
|                       | Ud3Dc3 | 9.26 | 8.88 | 8.71 | 8.69 | 8.75 | /    | /    |
| RS-4<br>2 Mpa<br>120° | Ua5Dd2 | 7.94 | 8.12 | 8.06 | 8.09 | 7.82 | /    | /    |
|                       | Uc5Db3 | 9.12 | 7.12 | 7.94 | 8.33 | 7.45 | /    | /    |
| RS-5<br>2 Mpa<br>150° | Ub2Dd4 | 7.74 | 7.67 | 7.54 | 7.71 | 7.48 | /    | /    |
|                       | Uc2Da4 | 7.36 | 7.7  | 7.33 | 7.43 | 8.23 | /    | /    |
| RS-6<br>2 Mpa<br>190° | Ua3Dc2 | 6.92 | 7.19 | 7.89 | 7.37 | 7.42 | 7.4  | /    |
|                       | Ub5Dd3 | 7.11 | 6.97 | 7.05 | 7.16 | 6.97 | /    | /    |

**Supplemental Table 5. Thickness of deformation bands under different effective normal stress conditions.**

Please refer to Supplemental Table 1.2.5.6.xlsx

**Supplemental Table 6. Particle diameter of host rock and deformation bands under different effective normal stress conditions.**

Please refer to Supplemental Table 1.2.5.6.xlsx

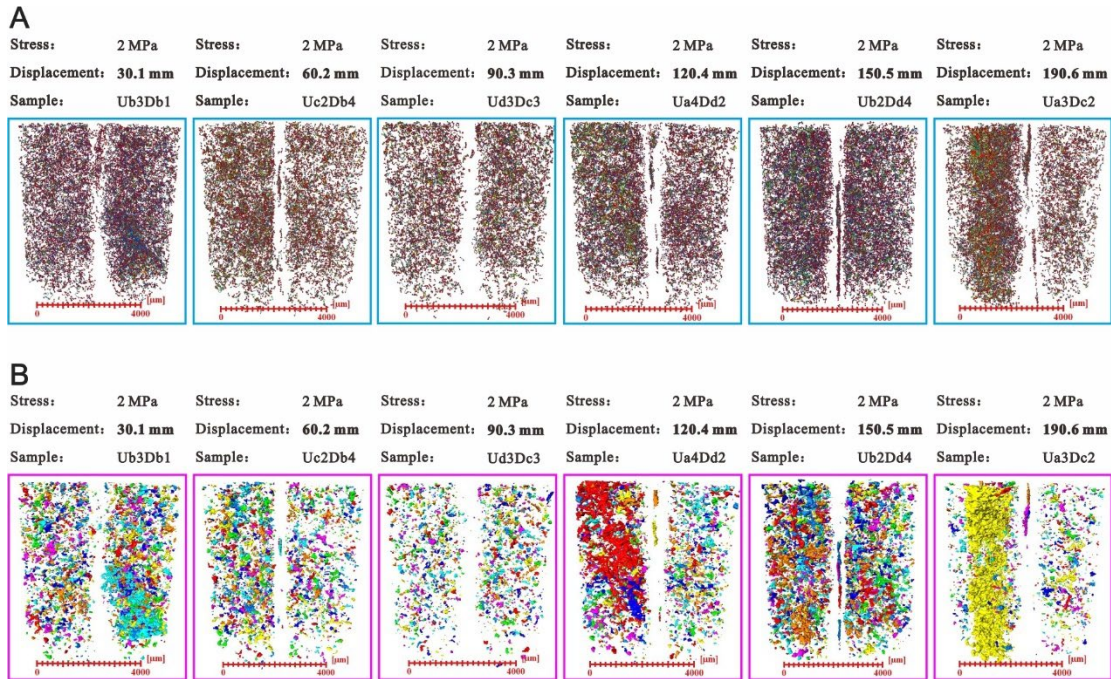
**Supplemental Table 7. Host rock porosity extracted by nano-CT electron scanning under different shear displacement conditions.**

| Experiment Number and Experimental Conditions | Sample Number | Porosity of Host Rock on the Left |       |       | Porosity of Host Rock on the Right |       |       |
|---|---------------|-----------------------------------|-------|-------|------------------------------------|-------|-------|
|   |               | NO.1                              | NO.2  | NO.3  | NO.4                               | NO.5  | NO.6  |
| RS-7<br>1 Mpa 90°                             | Ua2Dd2        | 29.4                              | 28.75 | /     | 28.3                               | 29.08 | 28.9  |
|   | Ud3Dc3        | 27.85                             | 28.98 | 27.94 | 29.21                              | 28.32 | /     |
| RS-8<br>1.5 Mpa<br>90°                        | Uc3Db3        | 28.7                              | 28.31 | /     | 28.56                              | 28.85 | 28.35 |
|   | Ud2Dc2        | 29.26                             | 28.98 | /     | 28.3                               | 28.99 | 28.47 |
| RS-9<br>2.5 Mpa<br>90°                        | Ua2Dd2        | 28.77                             | 28.87 | /     | 27.3                               | 28.99 | 28.27 |
|   | Ub5Da5        | 28.69                             | 28.18 | /     | 28.63                              | 28.16 | 28.69 |
| RS-10<br>3 Mpa 190°                           | Ua5Dd5        | 28.71                             | 28.68 | 28.81 | 29.62                              | 28.41 | 28.64 |
|   | Ub2Da2        | 28.18                             | 28.57 | /     | 28.19                              | 29.73 | 28.4  |

**Supplemental Table 8. Porosity extracted of deformation bands by nano-CT electron scanning under different shear displacement conditions.**

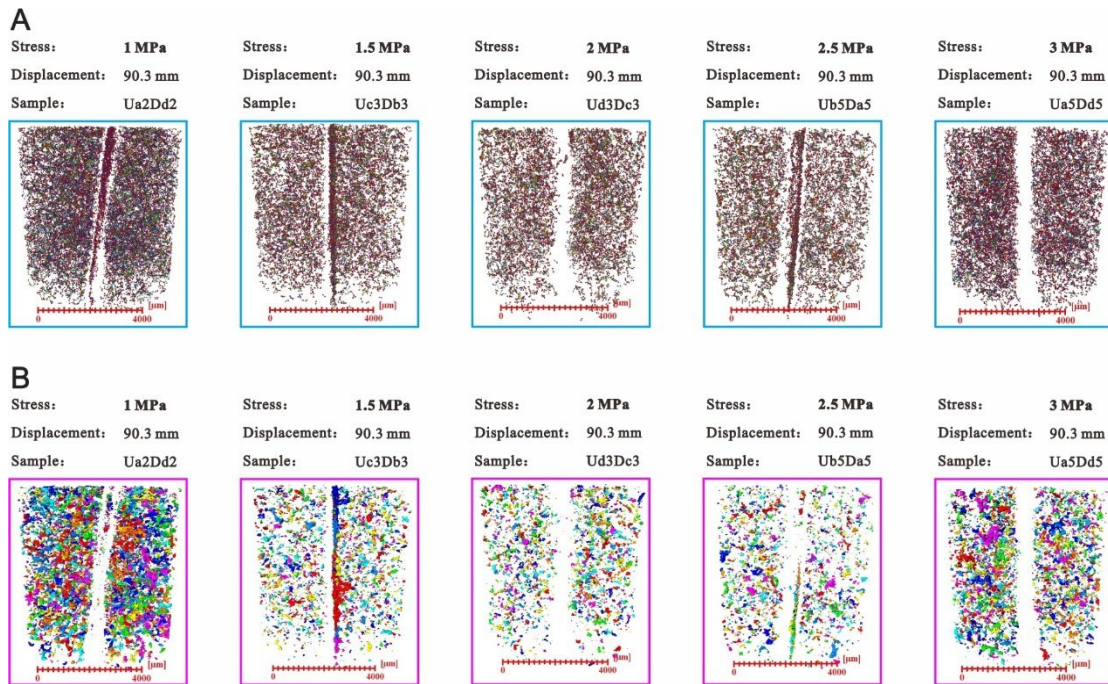
| Experiment Number and Experimental Conditions | Sample Number | Porosity of Deformation Bands |      |      |      |      |      |
|---|---------------|-------------------------------|------|------|------|------|------|
|   |               | No.1                          | No.2 | No.3 | No.4 | No.5 | No.6 |
| RS-7<br>1 Mpa 90°                             | Ua2Dd2        | 8.73                          | 8.63 | 8.65 | 8.65 | 8.82 | /    |
|   | Ud3Dc3        | 8.75                          | 8.94 | 8.91 | 8.15 | 8.52 | /    |
| RS-8<br>1.5 Mpa 90°                           | Uc3Db3        | 8.51                          | 8.48 | 8.55 | 8.6  | /    | /    |
|   | Ud2Dc2        | 8.58                          | 8.47 | 8.5  | 8.55 | 8.51 | 8.54 |
| RS-9<br>2.5 Mpa 90°                           | Ua2Dd2        | 7.8                           | 8.25 | 8.05 | 8.09 | /    | /    |
|   | Ub5Da5        | 8.01                          | 8.09 | 8.05 | 8.16 | 7.96 | 7.91 |
| RS-10<br>3 Mpa 190°                           | Ua5Dd5        | 6.96                          | 7.08 | 6.91 | 7.02 | 7.12 | /    |
|   | Ub2Da2        | 7.19                          | 7.37 | 7.57 | 7.3  | 7.64 | /    |

**Supplemental Figure S1. 3D pore-throat models of pore throats and 3D pore-connected models under different shear displacement conditions (colorplate).**



(A) 3D pore-throat models. (B) 3D pore-connected models. In the 3D pore-throat model, a pore throat consists of two red balls and a green stick. At larger scales, the density of the model represents the throat characteristics of the rock. In the 3D pore-connected model, a pore-connected consists of a number of blocks of the same color. The color is random, but the color of adjacent models must be different. The blank space in each figure represents deformation bands. However, due to process problems (currently unable to resolve), there are dense pore throat ball-stick components in some deformation bands, which represent unclosed cracks.

**Supplemental Figure S2. 3D pore-throat models of pore throats and 3D pore-connected models under different normal effective stress conditions (colorplate).**



(A) 3D pore-throat models. (B) 3D pore-connected models. In the 3D pore-throat model, a pore throat consists of two red balls and a green stick. At larger scales, the density of the model represents the throat characteristics of the rock. In the 3D pore-connected model, a pore-connected consists of a number of blocks of the same color. The color is random, but the color of adjacent models must be different. The blank space in each figure represents deformation bands. However, due to process problems (currently unable to resolve), there are dense pore throat ball-stick components in some deformation bands, which represent unclosed cracks.