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 MLF Experimental Report	提出日 Date of Report
課題番号 Project No. 2015A0063 実験課題名 Title of experiment Measurements of strain distribution in rock samples under compression 実験責任者名 Name of principal investigator Jun ABE 所属 Affiliation CROSS Tokai	装置責任者 Name of responsible person Kazuya Aizawa 装置名 Name of Instrument/(BL No.) BL-19 実施日 Date of Experiment 2016/3/26-2016/3/28

試料、実験方法、利用の結果得られた主なデータ、考察、結論等を、記述して下さい。(適宜、図表添付のこと)
 Please report your samples, experimental method and results, discussion and conclusions. Please add figures and tables for better explanation.

1. 試料 Name of sample(s) and chemical formula, or compositions including physical form.
-Berea Sandstone, phi25 x L50 mm, SiO2 -Izumi Sandstone, phi25 x L50 mm, SiO2 -Tomita Sandstone, phi25 x L50 mm, SiO2

2. 実験方法及び結果 (実験がうまくいかなかった場合、その理由を記述してください。)
Experimental method and results. If you failed to conduct experiment as planned, please describe reasons.
<p>In order to understand the mechanical behavior of rock materials, the strain measurements in rock specimens under uniaxial compression have been performed. Simultaneously, AE signals have also been measured. The experimental setup is shown in Figure1. The resolution ($\Delta d/d$) and the d-value range for neutron diffraction experiments were respectively 0.3 % (medium-resolution mode of TAKUMI) and 1.4-4.2 Å (frame shift mode). In parallel with lattice strain measurements using neutron diffraction technique, macroscopic strain values were recorded using a strain gauge attached to the surface of rock specimens. The AE signals were measured using PCI-2 (PHYSICAL ACOUSTICS CORP.). AE waves were detected using 4 miniature AE sensors (Micro 30) attached to the compression jig. The threshold was 40 dB was applied; this threshold level is 2-3 dB higher than noise level. The sampling rate was 10 MHz and the sampling time was 1 msec.</p> <p>Figure2 shows stress-strain curves. A discrepancies are found between macro strain and lattice strain; macro strain is larger than lattice strain. And macro strain exhibits a curve indicating plastic deformation behavior whereas lattice strain exhibits elastic behavior. After unloading, macro strain exhibits a residual</p>

2. 実験方法及び結果(つづき) Experimental method and results (continued)

strain.

Figure 3 shows the results of AE signal measurements (red bar chart) together with the loading program (black solid line). AE signals were detected during the periods in the experiments when the applied stress was increased. The AE events might be correlated to grain-slip occurred in rock specimens.

The data analysis is under way.

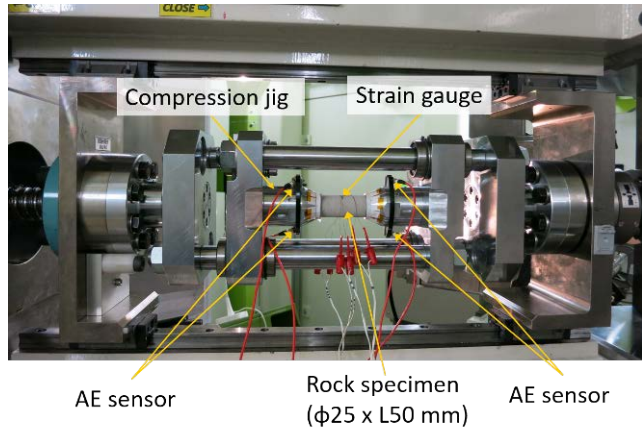


Fig. 1. Photograph of the experimental setup for in situ simultaneous measurement of neutron diffraction and AE signal under compression

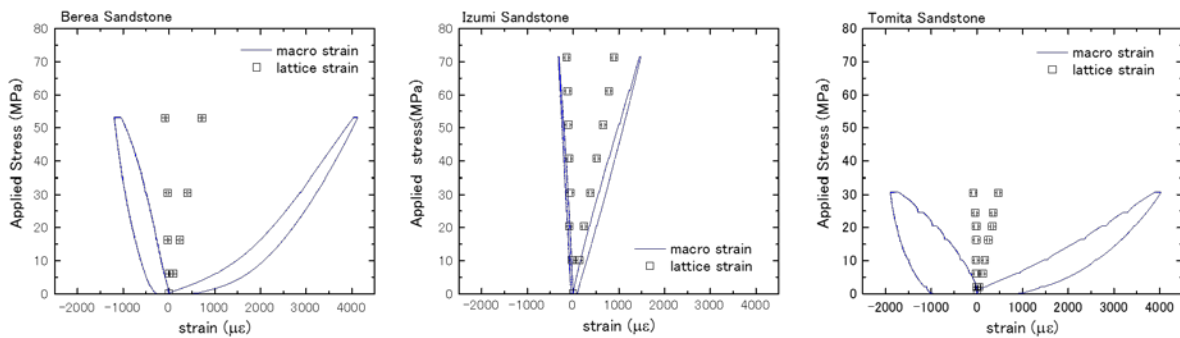


Fig. 2. Stress-strain curves. Macro strain measured by the strain gauge is denoted by solid line, and lattice strain evaluated from the change in lattice parameter value is plotted as point.

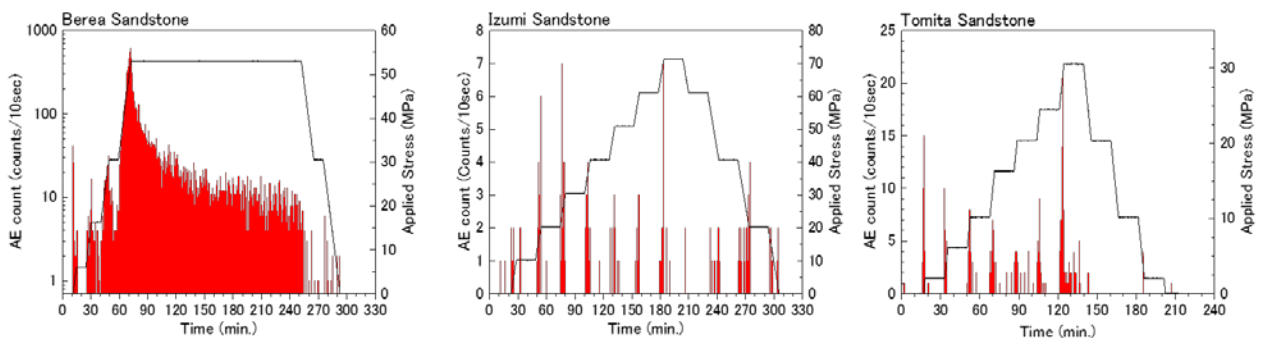


Fig. 3. Result of AE signal measurements together with the loading programs. The number of AE events per 10 seconds is indicated as a bar chart (left-handed axes). Applied stress value is indicated solid line (right-handed axes). Note that the vertical scale differs between rock samples.