

Neutron –TOF –diffraction study of intracrystalline residual strain at samples from the Mongolia

In this study, we investigated two samples; a granite and a sandstone sample, from the Mongol-Altai Mountains. The Southern Mongolia's territories are impacted to be a powerful tectonics and are still considered to be active seismic zones [1]. The extracted samples experienced a strong deformation on this location. The aim of the study is the investigation of residual lattice strains in the samples using neutron time-of-flight diffraction. Neutron diffraction is a powerful tool for the study of the residual stress behavior in bulk materials, like geological samples containing large grains [2]. The changes of the crystal lattice distances result in a shift of the characteristic Bragg reflection lines. This can be measured with high resolution by neutron time-of-flight diffraction techniques. Because of the high penetration depth of neutrons in matter, this method allows the strain investigation of polycrystalline bulk materials [3], [4].

Using this study we determined the residual strain in two rock types by neutron time-of-flight diffraction at the stress/strain diffractometer EPSILON at the pulsed neutron source IBR-2M.

A phase analysis of the granite and sandstone samples has been done by X-ray diffraction pattern. The content of the granite was determined as silicon dioxide (quartz –SiO₂), sodium aluminum silicate (albite –NaAlSi₃O₈), potassium aluminum silicate (microcline –KAlSi₃O₈), potassium aluminum silicate hydroxide (illite 2 –(KH₃O)Al₂Si₃AlO₁₀(OH)₂). The sandstone is contained silicon dioxide (quartz –SiO₂), iron magnesium aluminum silicate hydroxide (clinochlore 1 –(Mg,Fe)₆(Si,Al)₄O₁₀(OH)₈), potassium aluminum silicate hydroxide (illite 2 –(K,H₃O)Al₂Si₃AlO₁₀(OH)₂), sodium calcium aluminum silicate (anorthite –(Na_{0.45}Ca_{0.55})(Al_{10.55}Si_{2.45}O₈)) from XRD diffraction pattern data.

References

- [1]. Genyao, W. (2013) J. Palaeogeography 2 (3), 306-317. [DOI: 10.3724/SP.J.1261.2013.00033]
- [2]. Scheffzük, Ch., Hempel, H., Frischbutter, A., Walther, K., & Schilling, F.R. (2012) J. Phys. Conf. Ser. 340, 012038.
- [3]. Scheffzük, Ch., Walther, K., and Frischbutter, A. (2014) Materials Science Forum 777, 136-141.
- [4]. Badmaarag, A., Scheffzük, Ch., and Sangaa D. (2016), Mongolian Journal of Physics 2, 442-448.

Author: Mr ALTANGEREL, Badmaarag (Mongolia)

Presenter: Mr ALTANGEREL, Badmaarag (Mongolia)

Track Classification: Applied Research