Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

SCG69-03 Room:102B Time:May 24 09:30-09:45

Generation of Electromotive Force and Changes of Seebeck Coefficient for Igneous Rock Blocks Subjected to Inhomogeneous

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To study mechanisms of electromagnetic phenomena related to earthquakes, we have conducted laboratory experiments using rock samples. According to our previous experiments, when a terminal of an air-dried igneous rock block is uniaxially loaded, there appears the electromotive force making electric currents flow from the stressed volume to the unstressed volume. There is a positive correlation between the degree of stress/strain and the electromotive force. However, because quartz-free gabbro tends to generate the stronger electromotive force than quartz-rich granite, it is inconsistent to consider piezo-electric effect as the main factor of this electromotive force. To explain this force, we have proposed that peroxy bonds, which are one of the most popular lattice defects in igneous rock-forming minerals, are deformed and become accepters. This can lead to the activation of positive holes. In the last reports, to verify ”positive hole activation”, we measured thermoelectromotive force of air-dried gabbro blocks under the same loading/unloading conditions and inspected the changes of its Seebeck coefficient. As a result, we confirmed that the concentration of holes increased in the loaded volume, i.e. the positive hole activation, and such a change was little in the load-free volume. In this report, we conduct the same laboratory experiments for various types of rock blocks and inspect whether or not the positive hole activation is universal in igneous rocks.

Keywords: Seismo-electromagnetics, Igneous rock, Electromotive force, Lattice defect, Positive hole