Interpretation of Geological Deformation History Using Flat-cutting Surfaces of the Inner Wall of KURT

Soolim Jung*, Sung-Hoon Ji, and Kyung-Su Kim
Korea Atomic Energy Research Institute, 111, Daedeok-daero 989beon-gil, Yuseong-gu, Daejeon, Republic of Korea
*sljung@kaeri.re.kr

1. Introduction

In order to prevent the effect of radioactive waste on the ecosystem, it is important to understand the deep geological environment where the repository will be located. Especially, it is necessary to identify evolution processes and evaluate long-term stability of the deep geological environment so that the repository can be isolated from accessible biosphere during the long-term geological evolution. The KAERI Underground Research Tunnel (KURT) was constructed in 2006, and has been operated for site characterization research in terms of safety assessment of nuclear waste disposal. In this study, we will interpret the long-term brittle deformation history around the KURT site using flat-cutting surfaces and exposed outcrops of the inner wall of the Tunnel.

2. Study area

The KURT is located in the boundary between Okcheon Belt and Kyunggi Massif. The area is composed mainly of the Mesozoic granitoids, which is intruded in the north-east direction[1]. Regional scale area around KURT site includes various type of granitic rock such as biotite granite, two-mica granite, granite porphyry, and alkaline granite, which is evidence of continuous volcanic activity and dyke intrusion.

According to previous field survey, the major rock composition of the KURT site is two-mica granite. Weakly foliated biotite granite was also observed.

3. Methods

To understand the geological information around the research area, various geological surveys were conducted, including a literature survey, surface geophysical survey, geological lineaments analysis, field observations, borehole investigations, chemical analyses, age dating of the rock samples, and a structural analysis of the exposed outcrop and flat-cut surface inside KURT. In this paper, we focus on the results of field work and observations along the tunnel.

Two flat-cut sections were constructed to aid in the research of geological structures in the tunnel. The sections are rectangular cut surfaces measuring 5m in width and 2.5m in length. By analyzing these surfaces where the geological structure is evident, it is possible to understand the texture of rock masses and to estimate the cross-cut relationship of each structure. In addition to the surfaces, relatively fresh outcrops located in the several research modules of the KURT were observed to interpret the history of brittle deformation.

4. Results

From the study on the fracture system observed in the tunnel and the chemistry using samples from the flat-cutting surfaces, five sets of joints, two directions of major faults and three dominant rock types are identified. Although some relative ages are not yet clear, the simplified deformation history can

be interpreted as follows. The basement rock of the research area was intruded by Jurassic granite. The granite was mylonitized at deep depth and intruded by another Jurassic granite. During the cooling, pegmatitic dykes were intruded. Uplifting and volume change of rock mass caused brittle deformation. Several sets of joints formed under local stress fields. Mafic dykes were intruded along the joint surfaces. Faults occurred and crosscut mafic dykes.

REFERENCES

[1] H.-I. Park, J.-D. Lee, J.G. Jeong, “Geological map of Korea: Yuseong sheet”, Korea Institute of Geoscience and Mineral Resources (1977).