Au-Ag mineralization in Togi vein type deposits, Ishikawa, Japan

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Togi mine located in middle of Noto Peninsula, Ishikawa Prefecture, Japan, consists of Ag-Au vein deposits, and is regarded as one of the important ore deposit relating to the formation of the Noto Peninsula and Japan Sea. However, Au- and Ag-minerals and formation process of Togi mine have not been studied systematically. In this study, the ore formation process and hydrothermal activity were investigated to clarify the ore mineral species. Gravity anormaly in the Togi mine area was also investigated to understand the geological setting of the Togi deposit.

Host igneous rocks of the deposits are pyroxene andesite lava and pyroclastic rocks belonging to the Neogene Anamizu formation. The ores were mainly produced from Mori and Togo tunnels. Samples of ores and wall rocks were collected at Togo No.3 tunnel. There are some altered veins and quartz veins in the tunnel. Most phenocrysts in the pyroxene andesite altered to chlorite, mica, and leucoxene. At the contact region between quartz veins and the wall rocks, adularia and chalcopyrite are formed. A couple of generations of adularia grown on the quartz suggest that the hydrothernal solution intruded more than 2 times during the formation of Au-Ag minerals. Electrum, argentite, aguilarite, α-brass, native cupper, fischesserite, uytenbogaardtite and other ore minerals are found in the quartz veins. Ag contents of electrum attains up to 49.4 mol.%.

Samples for age determination were collected from the exposure near the Togo No.3 tunnel. The preliminary age data of smectite-illite mixed-layer clay in the deposit suggests that the Togi deposit was formed in Early Miocene, and that the formation of Togi deposit is related to the opening of the Japan Sea. It is considered that the submarine volcanic activity around 17 Ma (Kaseno, 1992) produced the andesite lava and pyroclastic rocks of Anamizu formation and hydrothermal solution which formed gold and silver minerals. It is supposed that the hydrothermal solution filled fishers generated by the normal fault movement, and Au-Ag-bearing veins were formed.