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Volcanic sequence related to Kuroko mineralization concerning with the island-arc development process in the northeast Honshu arc, Japan

Ryoichi YAMADA and Takeyoshi YOSHIDA
Graduate School of Science, Tohoku University

We have been investigating the massive sulfide mineralization concerning with detailed development process of the northeast Honshu magmatic arc. The magmatic arc was constructed by a back-arc spreading during 21-18 Ma (Yamato basin), the subsequent rifting during 18-13.5 Ma (Northern Honshu rift system, NH rift) and an island-arc uplifting from 13.5 Ma up to the present. The Kuroko deposits are a representative massive sulfide deposits and are the most important mineral resources in the magmatic arc. The Kuroko deposits distribute within a restricted area where is the finally rifted zone in the farthest position from the spreading-rifting axis.

The Yamato basin is entirely composed of sea floor basalt lavas and dolerite sheets with a chemical composition of MORB affinity. The NH rift system consists of parallel extended three volcanic belts these are the Aosawa-Hachimori rift, Ani intra-rift and Kuroko rift zones ranging from west to east. The rift volcanism is characterized by a basalt-dominant bimodal activity with increasing the felsic volcanics to the eastern rift zone through time. The chemical composition of the basalt changes laterally from back arc basin type (BABB) in the western rift (Aosawa-Hachimori rift) to island-arc tholeiite type (IAT) in the eastern rift (Kuroko rift). Nb against Zr contents from basalt to felsic rocks show positive linear trend in each rift system.In the Kuroko rift zone, the transition from rift to island-arc volcanism is recognized immediately after Kuroko formation. The pre-ore volcanism (rift stage) started with basaltic activity and was followed by intensive felsic hyaloclastic activity mainly composed of dacite lava and volcanic breccia under bathyal condition. The post-ore sequence also began with basaltic activity intercalated with mudstone and was followed by alternating beds of pumice tuff with several dacite lava flows and mudstone under relatively shallow water condition. Field and microscopic observations show that the pre-ore dacitic rocks are characterized by aphyric to plagioclase-phyric lava and pyroclastic flows, whereas the post-ore dacitic rocks are characterized by quartz-plagioclase-phyric aphanitic lavas and domes. The distribution of the normative compositions on the Q-An-Ab-Or

diagram suggest that the pre-ore dacite should be derived from a deeper magma chamber than that of the post-ore dacite. Several discrimination diagrams such as TiO_2-FeO(total)/MgO, Nb-SiO_2 and Nb/Y-Ti/Y indicate that the difference between the pre- and post-ore volcanism was caused by a different magmatic history with different origin.

All signatures mentioned above suggest that the difference of the magmatic history could be resulted from the tectonic conversion from a back-arc to an islandarc setting.