

Petrography and alteration of Cu-mineralization in the Niaz, Meshginshahr, NW Iran

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The Niaz area is located on the western part of the Cenozoic Alborz–Azerbaijan volcanic belt (Arasbaran sub-zone). The belt is also an important Cu–Mo–Au metallogenic province in northwestern Iran. The exposed rocks in the study area consist of a volcanoclastic sequence, subvolcanic rocks and intermediate to mafic lava flows of Paleogene age. The main host rocks are alkali granite to hornblende-biotite granite, monzonite to monzodiorite which have been intruded by andesitic to andesitic-basalt. Also several andesitic, rhyodacite to microgranite dykes have been intruded to the host rocks. The main host rock is monzonite to monzodiorite porphyry which is the host of main mineralization and alteration.

The geological and geochemical signature shows that the rocks are typical subduction-related magmatic complexes. The field observation, petrography and geochemical study show similarity to typical Cu-porphyry mineralization in the area. The main factors are monzonite stock, typical potassic, phyllic, prophylic and argillic alteration (zonality of the alteration patterns from intense phyllic at the center to outward weak-phyllic, argillic), stock works and disseminated Cu-mineralization, siliceous breccias and various fractures.

Actively forming Kuroko-style massive sulfide mineralisation and hydrothermal alteration at Iheya North, Okinawa Trough

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IODP Expedition 331 drilled five sites at the Iheya North hydrothermal field within the Okinawa Trough backarc basin. At Iheya North, hydrothermal alteration and sulfide mineralisation is hosted in a geologically complex mixed sequence of coarse pumiceous volcanoclastic and fine hemipelagic sediments, overlying dacitic to rhyolitic volcanic substrate.

At Site C0016, coring adjacent to the foot of an actively venting sulfide mound intersected massive sphalerite-(pyrite-chalcopyrite)-rich sulfides that strongly resemble the black ore of the Miocene-age Kuroko deposits of Japan – the first time that such material has been recovered from an active seafloor hydrothermal system. The sulfide mineralisation shows clear microtextural evidence of formation via a combination of surface detrital and subsurface chemical processes, with at least some sphalerite precipitating into void space in the rock. Altered volcanic rocks beneath the massive sulfide exhibit quartz-muscovite/illite and quartz-Mg-chlorite alteration, reminiscent of the proximal footwall alteration typically associated with ancient volcanic-hosted massive sulfide mineralisation.

At the nearby Site C0013, a likely location of recent high-temperature discharge, intense hydrothermal alteration obliterates primary mineralogy and texture. Near surface alteration is dominated by kaolinite and muscovite with locally abundant native sulfur, suggesting acidic fluids; grading to Mg-chlorite dominated assemblages at depths of >5m below sea floor. Late coarse-grained anhydrite veining overprints the earlier alteration and is interpreted to have precipitated from downwelling seawater that penetrated the sediments when hydrothermal activity at the site waned.

Sulfide-bearing samples from Site C0016 and Site C0013 have been sectioned and mapped using scanning electron microscope (SEM) and proton induced X-ray emission (PIXE) techniques for major and trace element composition. Sphalerite from C0016 contains very little iron, which is consistent with the low overall iron budget of the hydrothermal system. PIXE analyses are currently underway and trace elemental distributions revealed by this technique will be presented.