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Differentiation Between Endoskarn and Exoskarn Using Portable X-Ray Fluorescence (pXRF) at the Antakori Cu-Au-Ag Project, Northern Perú

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The Antakori project is located 50 km northwest of the city of Cajamarca, northern Peru.

The geology in the Antakori Project consists of Cretaceous quartzites, calcareous siltstones, and limestones. The Cretaceous basement is intruded by numerous porphyry dikes and stocks that have generated contact metamorphic haloes and metasomatic skarn alteration.

The skarn alteration is highly developed in the central and northern areas of the project, and it is a problem when you want to be precise when differentiating between exoskarn and endoskarn, since in some areas a "mottled" texture is generated, similar to that of a possible intrusive. The use of portable X-Ray Fluorescence (pXRF) has gained significant importance in mineral exploration. This technology has been able to collect geochemical data in a fast, accurate, and cheap way. In this study, (pXRF)-Olympus Delta has been used in geochemical mode on 130 core rock samples (limestone=20, marble=25, hornfels=10, exoskarn=40, unaltered intrusive=13, intrusive with moderate to strong alteration=20, samples with mottled texture [undifferentiated]=12) with three point measurements of 120s in each sample; finally, the three measurements were averaged to obtain a representative result for each sample. The data analysis was carried out with the ioGAS software, where bivariate diagrams of immobile elements were used. In addition, the most effective diagrams were Al vs. (Y, Nb, and Th), respectively. Undifferentiated samples with mottled texture correlated with the exoskarn field. The effectiveness of this method relies on the behavior of the elements used (Al vs. Y, Nb, Th), which during the environment and conditions of skarn formation, behave immobile; therefore, the geochemical signature of each wall rock (intrusive and sedimentary) is preserved and transmitted to its skarn equivalent (endoskarn and exoskarn). Geochemistry using pXRF has proven to be very useful to discriminate endoskarn from exoskarn and represents a powerful exploration tool.