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LITHOGEOCHEMICAL EXPLORATION OF MASSIVE SULFIDES AT PERAU BASE METAL MINE, PARANÁ, BRAZIL

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The Perau deposit is located in the Adrianópolis township, 30km south of the São Paulo-Paraná State limits, southern Brazil. The deposit is formed by two distinct orebodies. In the first one, the ore is mainly composed of galena, pyrite, chalcopyrite and sphalerite, and has an inferred reserve of 1.8 million metric tons, with 4% Pb, 2% Zn and 85g/t Ag, and the second is a copper deposit with 830,000 metric tons of ore with 2% Cu, locate below the first one. The main orebody has a stratabound structure, with dimensions of 800 x 700m, up to 6m thick striking 10°N and dipping 35°NW. The ore is underlain by a graphitic phyllite and overlain by a barite layer and a banded iron formation. All this suite is intercalated with calc-silicatic rocks. These are underlain by quartzites and overlain by mica-schists with intercalations of amphibolites. The whole sequence forms the Perau Formation of the Setuva Group, which is underlain by the pre-Setuva schists and gneisses. In the main orebody, zoning is recognized by its mineralogical distribution and revealed by trend surface analysis applied to 69 ore samples, with Zn increasing to the NW, Pb and Au to the SE and Cu to the NE. Tha statistical results from 84 rock samples, analysed by optical spectrography and atomic absorption, for 30 elements in the study of the geochemical halo were as follows: concentration-distance diagrams indicated progressive enrichment of Pb, B, Mg, Mn, Ba and K in the direction of the ore: whereas Be, V, Y, Cr, Ni, Sr, and Zn indicated depletion. Simple correlations with distance-to-ore indicated enrichment of Mn, Pb and Mg and depletion of Rb, Be, Sr and Sn. Cluster analysis was not able to separate samples taken near to the ore from those taken far from it. Multiple regression of distances-to-ore gave better results, with B and Cu for foot-wall rocks and Sr, Pb, Mn, La, B and SiO_2 for hanging-wall rocks showing enrichment and Ni, Zn, Be, Co, Cr and Ba showing depletion. Discriminant analysis was able to separate samples taken up to 200m from the ore from those taken at greater distances. The results obtained with concentrations corrected for lithological variation were little better than those for uncorrected ones. More weathered samples gave greater residuals in regressions and more misclassifications in discriminant analyses. Combining the results of all methods used, an enrichment is observed near the ore for La, B and Cu in foot-wall rocks and for Pb, B, Mg, Cu and K in hanging-wall rocks, with depletion for Sn, Zn, Be, Ni and Cr in hanging-wall rocks. The geochemical halo in rocks can be detected up to 200m from the ore. The behaviour of chemical elements and the stratigraphical and structural controls of the deposit are in accordance with an exhalative hypothesis for the ore genesis. The secondary halo in soils is expressed by Cu, Pb and Zn concentrations, as revealed by a 126-sample orientation study and a detailed 600-sample prospective survey. In this survey, the cost for detection of the halo in rocks and soils has proved to be nearly the same. The sampling of rocks in traverses perpendicular to the main geological survey and analysis for Cu, Pb, Zn, B, Mg, K, Fe, Mn and Ca, are recommended for prospecting deposits similar to Perau in this province.

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