DISTRIBUTION OF PLATINUM-GROUP ELEMENTS IN NICKEL-BEARING LATERITES IN PUERTO RICO

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INTRODUCTION

Nickel-bearing laterites and their underlying serpentinites in southwestern Puerto Rico have been the subject of several studies. The purpose of this reconnaissance study is to investigate the potential for platinum-group elements (PGE) and gold in the laterites.

GEOLOGY AND PGE POTENTIAL

The nickel-bearing laterites are on the southwestern end of the island East and South of Mayagüez (figure 1). The ultramafic rocks that underlie the laterites were emplaced over a period of time that began probably in the late Cretaceous (Mattson, 1960) and ended in the Eocene (Krushensky, oral commun., 1991). Mattson (1960) argued that the ultramafic rocks were exposed briefly during the Cretaceous and then were buried by a series of sedimentary formations until being exposed sometime during the Eocene, at which time the present-day laterite began to form. However, Krushensky (1978) presented evidence that deposition in western Puerto Rico was continuous from the Cretaceous to the middle Eocene. In either event, it seems clear that the great majority, if not all, of the laterite formed between the middle Eocene and the present.

Of the several studies of the laterites, the most extensive was by Heidenreich and Reynolds (1959), in which they examined 279 drill holes totaling nearly 3,300 m and assayed them for nickel, cobalt, iron, and chromium. Table 1 summarizes the resources of these metals, based upon a 0.6 percent Ni cutoff. Cram (1972) drilled some more in the largest of the deposits, the Guanajibo, and estimated 37 million tons of laterite at 1.2 percent Ni. Cram did not estimate the other metals. The two estimates are remarkably

close in terms of the amount of nickel in the Guanajibo area. Heidenreich and Reynolds' (1959) figures yield about 410,000 tons of nickel while Cram's figures yield about 440,000 tons of nickel (to the nearest 10,000 tons in each case).

Here we present the results of a reconnaissance sampling of the laterite for PGE in several areas. Elevated PGE values occur in laterites in Australia (see, for instance, Derrick, 1991). We collected samples at various locations where a complete section or nearly complete section of laterite (from serpentinite to the iron cap) was present. The samples were analyzed for PGE by ICP mass spectrometry. The results are shown in table 2 and graphically in figure 1. The PGE concentrations in the laterites are higher than the serpentinite directly below by a factor of 4.3 to 11.7, averaging 7.4. The highest total concentration of PGE is in the Maricao East deposit (about 340 parts per billion, or ppb). In almost every profile the content of PGE increases just above the laterite-serpentinite contact and remains high throughout the laterite profile. Only in the upper part of the Las Mesas 1 locality does the PGE content drop back to near the levels of the serpentinite. Preliminary geochemical analysis of other elements indicates a good correlation between PGE and cobalt. However, further detailed study will be necessary in order to elucidate the relation between the changes in PGE and the other chemical changes that have occurred in the laterite. All the samples were analyzed for gold and all were found to contain less than the detection limit of 0.01 ppm.

Although the data presented here are not detailed, they do show significant increases in PGE concentration in Puerto Rican laterites over that of bedrock. These increases suggest similarities to the laterite developed over some Alaskan-type complexes in New South Wales, Australia (Elliott and Martin, 1991). Detailed exploration and drilling revealed that PGE concentrations in one of them, the Tout complex, has typical grades of platinum of 20-50 ppb in dunite and 800 ppb in the overlying laterite, and some assays are as high as 16 ppm (Derrick, 1991). If that kind of enhancement is encountered in western Puerto Rico as a result of subsequent, more detailed study, PGE values of hundreds of ppb to perhaps 1 ppm may be encountered. On the basis of these observations, the Puerto Rican laterites may be considered a speculative resource for platinum- group elements.

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