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NEUTRON ACTIVATION ANALYSIS OF PLATINUM, PALLADIUM, IRIDIUM AND GOLD IN REFERENCE MATERIALS: A COMPARISON BETWEEN TWO METHODS

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In recent years, there has been great interest in the development of sensitive and reliable analytical techniques for the determination of platinum group elements (PGE) and gold in terrestrial materials. This is not only due to the growing economic interest of PGE and gold as mineral resources, but also to the information these elements can provide on metal geochemistry. Determination of very low amounts of iridium is particularly important in studying some of the anomalies in iridium distribution in sedimentary rock samples related to catastrophic events.

In the present paper, a neutron activation method was developed for the determination of platinum, palladium, iridium and gold in geological samples. The method was applied to the reference materials SARM-7 (MINTEK - South Africa) and CHR-Pt+ (CRPG), a silicate and a chromitite, respectively. The procedure consisted of the irradiation of about 250 mg of the sample, in the IEA-R1 nuclear reactor at IPEN-CNEN/SP, followed by a chemical treatment of the rock, precipitation of the PGE with tellurium, and high resolution gamma spectrometry with a hyperpure Ge detector.

Two different methods were used for the chemical treatment of the rock: an aqua regia leaching and a sinterization with sodium peroxide in a nickel crucible, for 90 minutes at 480°C. Previous work for the analysis of SARM-7 [1] and preliminary results for the reference sample CHR-Pt+ showed that, for Au, Pd and, to a lesser extent Pt, both procedures presented data in good agreement with reported values (relative errors about 15%) and precision better than 10%. For Ir, a remarkable improvement in accuracy was achieved when the sinterization of the rock was employed, the relative error in SARM-7 analysis changing from 57% to 3%, showing that, for this element, the total dissolution of the rock was more efficient.

As a conclusion, the sinterization with sodium peroxide seems to be more suitable for the analysed elements. The whole procedure is simple and fast, giving accurate and precise results, and can be applied to different matrices to which minerals of PGE are frequently associated.

1. Nogueira, C.A. and Figueiredo, A.M.G., 4th Geochemical Brazilian Congress, Expanded Abstracts, 1993, 283-285.