

Rhodium Hybrid Fire Assay Procedure at Xstrata Zinc Brunswick Smelter

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Brunswick Smelter is a lead smelter located in Belledune, New Brunswick. Besides refined lead, the plant produces nearly-refined silver (called “doré”, with gold and copper as the main contaminants) and some by-products (sulphuric acid, copper matte and copper speiss). Prior to 2003, Fire Assay at Xstrata Zinc Brunswick Smelter was performed strictly for gold and silver only.

Traditionally, the plant feed material consisted mainly of lead concentrates (sulphides) from Brunswick Mine (located south of Bathurst, New Brunswick) and mining operations located in Central and South America, with secondary materials consisting mainly of lead-laden waste materials from industrial sites throughout North America.

With China’s recent rapid industrial growth, Brunswick Smelter’s marketing strategy was revised to meet the new challenges head-on. The current blast furnace design, coupled with two short rotary furnaces, enables the site to process new value-added materials from around the world, such as different lead compounds (sulphates, carbonates, hydroxides, chromates, etc) and silver/gold concentrates.

These materials became the source of platinum group elements (PGE’s) that had to be accounted for. Specifically, the new elements required for assays due to new contract stipulations were palladium, platinum and rhodium. Thus, a Fire Assay PGE method was required in short order.

Fortunately, the Laboratory was equipped with an Inductively Coupled Plasma Optical Emission Spectrometer (ICP-OES). All that was required was getting these PGE’s into solution. This is when I became familiar with rhodium’s chemical properties. Rhodium is usually not attacked by acids unless it is oxidized in an alkaline fusion first. Conventional litharge-based Fire Assay would be inefficient for rhodium analysis and the nickel-sulphide fusion normally used for PGE’s is susceptible to certain contaminants that would be found in the feed materials analyzed.

I hit upon the idea of combining the two Fire Assay methods. Combined with a very simple way of preventing PGE cupel loss, this “Rhodium Hybrid Fire Assay Procedure” was ‘fine-tuned’ over the course of a year and is now routinely used at Brunswick Smelter. Interestingly enough, the combination eliminates the shortcomings of both individual Fire Assay methods.