



Interference removals on Pd, Ru and Au with ICP-QQQ-MS in PGE RM

Syed Nadeem Hussain Bokhari, Thomas Meisel, and Christoph Walkner

Montanuniversität Leoben, General and Analytical Chemistry, Leoben, Austria
(Syed-Nadeem-Hussain.Bokhari@unileoben.ac.at)

Gold and platinum group elements (PGE) are essential industrial precious metals with high world demand due to their unique properties. Struggle for natural exploration of PGE is on great pace and recycling from industrial wastes, electronics and catalytic convertor is on the rise for PGE supply chain. Along with these developments it is becoming more challenging for analytical chemists to determine gold and PGE out of complex matrix which causes severe interferences. The current state of art is online analysis coupled with chromatographic separation of interferences.

The ICP-QQQ-MS Agilent 8800 has the capability of using multi tunes and mass shifts. We aim to remove interferences on Pd⁺ (for direct and isotope dilution analysis) Au⁺ and Ru⁺ in lieu of chemical separations. YO⁺, SrOH⁺, ZnAr⁺, NiAr⁺, ZrO⁺, CuAr⁺, MoO⁺, Ru⁺ and Cd⁺ are expected interferences on Pd⁺ while Au⁺ is interfered by TaO⁺, HfOH⁺, GdAr⁺ and ¹⁰²Ru⁺, ¹⁰⁴Ru⁺ by ¹⁰²Pd⁺, ¹⁰⁴Pd⁺ etc. Initial test were performed on pure solutions of 1mg/l (interfering elements): 1 ng/l (Pd, Ru & Au) respectively. The outcomes of initial tests were applied on PGE reference material (RM) WGM-1 and SARM-7 (digested with Na₂O₂ sintering).

The results obtained show that YO⁺, SrOH⁺ interfere (¹⁰⁴Pd, ¹⁰⁵Pd), ¹⁰⁴ Ru⁺ on (¹⁰⁴Pd), ZnAr⁺ has slight interference on (¹⁰⁴Pd and ¹⁰⁶Pd), ZrO⁺, NiAr⁺, CuAr⁺ interferences are negligible, MoO⁺ has severe interference on (¹⁰⁸Pd, ¹¹⁰Pd) and that Cd⁺ has severe isobaric interference on (¹⁰⁶Pd, ¹⁰⁸Pd, ¹¹⁰Pd). These interference have been removed by formation of Pd(NH₃)₃⁺ complex. The TaO⁺, HfOH⁺ and GdAr⁺ interferences on Au⁺ are best removed by formation of Au(NH₃)⁺ and Au(NH₃)₂⁺ complexes. ¹⁰²Pd⁺, ¹⁰⁴Pd⁺ interference on ¹⁰²Ru⁺, ¹⁰⁴Ru⁺ can be removed by formation of Ru(NH₃)₄⁺ and RuO⁺ compounds. The results obtained comply with certified values of RM. The developed method is being tested on low concentration PGE reference materials.

References: Sugiyama, N. " Removal of complex spectral interferences on noble metal isotopes." Agilent 8800 ICP-QQQ Application Handbook, 2014, 42-46.