Production and certification of Pd and Pt single spikes

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So-called spikes are solutions of isotopically enriched elements, which are used in isotope dilution mass spectrometry (IDMS) for the accurate quantification of element concentrations. Based on its proven records, especially in reference material certification IDMS is considered as one of the most powerful and most accurate methods for determining amounts of substance. [1] Contrary to other calibration approaches, IDMS does not directly suffer from long-time changes or drifts in instrument sensitivity. Moreover, provided isotopic exchange between the sample and spike is ensured, losses of analyte do not affect the analytical result. Both advantages are based on the fact that IDMS only requires isotope ratio measurements and isotope ratios are largely unaffected by instrumental drift, setup or by matrix, unless an isobaric interference is present.

IDMS often is applied for quantification of platinum group elements (PGE), either for reference material characterization or for geochemical research. [2] The main reasons for that are the required accuracy and the low PGE mass fractions in the sample. A crucial point in IDMS is, however, the availability of certified spikes. Unfortunately, no such certified spike solutions are available yet for PGE.

To fill this gap, at least partially, two single PGE spikes, one ^{106}Pd and one ^{194}Pt spike, have been produced and characterized. The selection of the isotopes, the production of the solutions and the ampoulation will be described in this presentation. Details on the characterization of these spike solutions by reverse IDMS using a primary assay for Pd and Pt will be given offering high purity (> 99.9). All relevant data – mass fraction of the spike isotope, isotopic composition and measurement uncertainties – will be presented. Both spike solutions are intended to become certifed reference materials under the ERM® label [3].

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Microbial response on siderophores of heavy metal resistant streptomycetes

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Large soil contamination by mining activities poses a severe environmental problem. The former uranium mining district Ronneburg (Thuringia, Germany) has been mined for more than 40 years until remediation of the area started in the 1990's. Resulting from mining, the banks of the creeks in the area show high concentrations of Ni, Cu, Mn and Zn and microorganisms have to adapt to these conditions. Thus, the area represents a store to screen for heavy metal resistant strains and their resistance mechanisms, such as the excretion of chelating ligands like siderophores. These mobilise, transport and store Fe^{3+} as well as other (heavy) metals in the environment. This causes a modulation of metal availability to other organisms and may influence motile and growing organisms to perform chemotaxis towards or away from a siderophore gradient to get into better living conditions.

Through the application of a new agar-plate method we were able to investigate chemotactic behaviour of different fungal and bacterial isolates to siderophores. A defined content of siderophores in culture supernatants of three different heavy metal resistant *Streptomyces* strains was supplied with Fe-deficient agar media in divided plates. Streptomycetes as well as fungi were inoculated on the non-siderophore containing side of the plate. Their growth was monitored with respect to effects exerted by the added siderophores.

Fungal strains showed faster growth towards the siderophore-free side while there, changes in morphology to fruitbody producing stages with increased development of aerial mycelium. Expecting a shift in the main area of growth for the whole colony, the tested *Streptomyces* strains displayed negative chemotaxis with siderophores while control showed equal growth. The strains *S. acidiscabies* E13 and *S. tendae* F4 showed lacks of substrate mycelium and a different pigment production indicative of a stress reaction.

Our results suggest that siderophores may play an important role in nature, not only in modulating metal availability, but also as signalling molecules.

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