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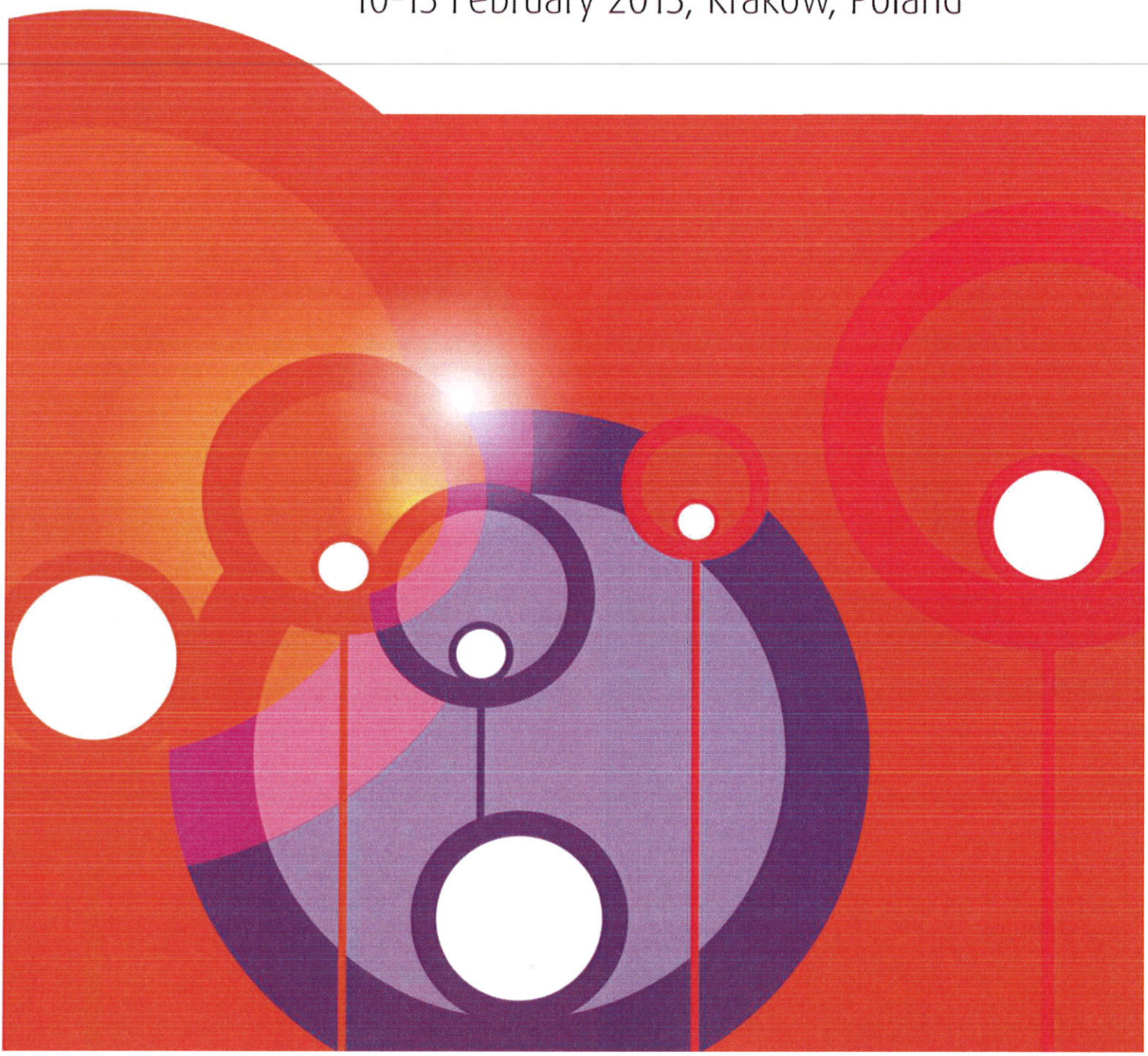

DISPERSED PARTICLE EXTRACTION – A NOVEL APPROACH FOR ANALYTE ENRICHMENT AND MATRIX REMOVAL

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"Conventional" Solid Phase Extraction (SPE) is a well-established technique and undisputedly a onvenient tool for sample pre-treatment. However, in certain cases, it suffers from problematic elution procedures, since quantitative recoveries can only be obtained by using concentrated acids, organic solvents and/or noxious eluting agents. Besides concerns about operational safety, the obtained solutions are usually not adequate for ICP analysis since they may cause corrosion and exhibit adverse effects on the plasma.

Therefore, a novel approach for SPE-based sample pre-treatment is introduced to the field of inorganic trace analysis. Here, the analyte-resin adduct is analyzed directly with no elution required. The proposed Dispersed Particle Extraction is based on the state-of-the-art principle of "on-bead detection" which is frequently used in bio-analytical chemistry. There, analyte-loaded beads with diameters in the order of 50 to 100 µm are analyzed using flow-through cells in combination with photometric, fluorescence and chemiluminescence detection [1-4].

Sorbent beads of this size are not compatible with standard sample introduction devices for ICP techniques. Therefore, we use sub-µm silica particles equipped with a nano-porous surface which is chemically modified to obtain Strong Anionic and Strong Cationic Exchanger functionalities (SAX and SCX, respectively). By dispersing these particles in a liquid sample ("Dispersed Particle Extraction"), the analytes are retained on the particle surface. Thus, the analytes can be separated from the sample by removing the particles from the surrounding solution. After chemical decomposition of the nano-particles, the obtained clear solution can be analyzed via conventional ICP-MS instrumentation. Due to the small particle diameter and the porous structure, extremely low amounts of the material are sufficient for quantitative recoveries. Another benefit of the Dispersed Particle Extraction is the implementation of the "renewable surfaces principle" where fresh sorbent material is used for each analysis. This completely eliminates memory-effects or analyte losses usually observed when repeatedly using SPE columns.

In order to highlight the advantages of Dispersed Particle Extraction we present an overview of the following applications:

a) determination of rare earth elements in saline waters,
b) separation of uranium and thorium for improved age-determination of nuclear material,
c) determination of platinum group elements in urban roadside-dust.

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