

Comparison of mininaturised sample treatment systems for As speciation in human hair and nails

Christian Dietz, E. Sanz, Carmen Cámara

Complutense University of Madrid, Faculty of Chemistry, Dept. Analytical Chemistry, Avda. Complutense s/n, 28040 Madrid, Spain

Arsenic speciation in order to understand its biological pathways, transformation and accumulation/elimination processes is still a hot topic in Analytical Chemistry, since an important part of the worldwide population live in areas which have to be considered moderate to highly contaminated. Nowadays, sensitive and robust separation and detection techniques such as HPLC-ICP/MS are available, wherefore sample treatment usually becomes the limiting step of an analytical method regarding time, sample and reagent consumption and species integrity.

The most commonly used bioindicators to assess human exposure to arsenic are blood, urine, nails and hair. The latter possesses some advantages over the former, in particular that commonly found concentrations are elevated, the matrix is easy to sample, store and to transport. However, methods for arsenic speciation are scarce for these type of matrices, in general these are multi-step treatments which suffer from elevated analyte extraction times.

In this communication, modern approaches making use of miniaturised pressurised liquid extraction (PLE) and ultrasound probe sonication (UPS), where appropriate in combination with mixed enzymatic treatments, applied to arsenic speciation in hair and nails will be critically discussed. Critical parameters during the optimization procedure for the different techniques will be presented and their suitability highlighted by application to real samples coming from highly arsenic contaminated areas in the middle and lower Ganga Plain, India.

Both methods profile as powerful tools for sample treatment, providing a mild procedure to extract biomolecule bound organometallic species, which would be destroyed by more aggressive leaching or solubilization methods. In most cases, quantitative extraction in a very short time with respect to generally used methods could be achieved (reduction from hours to minutes). Other advantages are a simplified sample handling and the reduction of reagent consumption and sample amount.