

Waters Colloidal Phase Extraction and Preconcentration: Method Comparison

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Abstract : Colloids are ubiquitous in the environment and are known to play a major role in enhancing the transport of trace elements, thus being an important vector for contaminants dispersion. Colloids study and characterization are necessary to improve our understanding of the fate of pollutants in the environment. However, in stream water and groundwater, colloids are often very poorly concentrated. It is therefore necessary to pre-concentrate colloids in order to get enough material for analysis, while preserving their initial structure. Many techniques are used to extract and/or pre-concentrate the colloidal phase from bulk aqueous phase, but yet there is neither reference method nor estimation of the impact of these different techniques on the colloids structure, as well as the bias introduced by the separation method. In the present work, we have tested and compared several methods of colloidal phase extraction/pre-concentration, and their impact on colloids properties, particularly their size distribution and their elementary composition. Ultrafiltration methods (frontal, tangential and centrifugal) have been considered since they are widely used for the extraction of colloids in natural waters. To compare these methods, a 'synthetic groundwater' was used as a reference. The size distribution (obtained by Field-Flow Fractionation (FFF)) and the chemical composition of the colloidal phase (obtained by Inductively Coupled Plasma Mass Spectrometry (ICPMS) and Total Organic Carbon analysis (TOC)) were chosen as comparison factors. In this way, it is possible to estimate the pre-concentration impact on the colloidal phase preservation. It appears that some of these methods preserve in a more efficient manner the colloidal phase composition while others are easier/faster to use. The choice of the extraction/pre-concentration method is therefore a compromise between efficiency (including speed and ease of use) and impact on the structural and chemical composition of the colloidal phase. In perspective, the use of these methods should enhance the consideration of colloidal phase in the transport of pollutants in environmental assessment studies and forensics.

Keywords : chemical composition, colloids, extraction, preconcentration methods, size distribution

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