

Development of Analytical Methods for Determination Azaarenes and Azaarones in Environmental Matrices

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A new method for the analysis of azaarenes and their degradation products (azaarones) was developed, optimized and validated using liquid chromatography coupled with atmospheric pressure photo ionization tandem mass spectrometric detection (LC-APPI/MS/MS). The presences of azaarenes in environmental significant concentrations were proofed in soil, sediment, water, air and biota. Additionally an unknown part of the azaarenes is biologically or photochemically oxidized in the aquatic environment to azaarones. The concentrations of azaarones measured in sediments are higher than the concentrations of parental azaarenes. Studies have shown that although generally the acute toxicity is decreasing from azaarenes to azaarones, some of the azaarones have much lower toxic effect concentrations than azaarenes, in fact comparable with PAHs. Thus for the evaluation of the total toxic pressure of polyaromatic compound influent water and benthic organisms is necessary evaluated not only the PAHs, but also the azaarenes and azaarones present in the environment. In our project seventeen compounds of azaarenes and azaarones were analyzed in sediment samples. All compounds were analysed simultaneously in multi reaction monitoring (MRM) mode. Soxhlet extraction was used for the extraction of analytes from sediments. The low limits of quantification of azaarenes and azaarones were reached with low matrix interferences. The method was tested on real sediment samples from Dutch rivers Rhine in Rotterdam and Western Scheldt near Antwerp and the results were compared with previous studies. To our knowledge, this is the first time showing the possibility of measurement non-polar polyaromatic hydrocarbons together with polar azaarenes and their degradation products azaarones simultaneously with sufficient sensitivity and accuracy using LC/MS/MS. The method was further used for measurement sediment samples collected in period 1996-2011 in Dutch Waddensee and spatial and temporal trends of azaarenes and azaarones in sediment were determined. It was shown that the chemical quality of environment in Wadden Sea is determined mainly by the quality of water by rivers Rhine and Scheldt which influent Wadden Sea through the sea streams in North Sea, through the contamination in Ijsselmeer in the Netherlands and with river Ems, Weser and Elbe flowing directly to Wadden Sea in Germany. Thanks to the low sediment exchange in Wadden Sea the pollution from those sources is accumulated in this area.