



Contribution ID: 714

Type: Poster

Application of chromatographic techniques in radiocarbon dating

Monday, May 14, 2018 6:30 PM (15 minutes)

Chromatographic techniques are applicable in a wide spectrum of scientific fields and are also advantageous in different kinds of interdisciplinary research. By these techniques we are able to analyse compound composition of unknown samples, purity of solvents but they can be applied also for the preparation of analytes with subsequent analysis of stable or radioactive isotopes. Based on obtained results, we can also evaluate the effectiveness of sample preparation routines.

One of the promising application of chromatography is in the field of radiocarbon dating. Using different chromatographic techniques, it is possible to eliminate or remove possible contaminating agents which could distort final results of ^{14}C activity. One of the example is preparative GC (Gas Chromatography) which could isolate e.g. fatty acid from the mixture of lipophilic compounds extracted from bones or archaeological pottery. Further, we can use micro-preparative column chromatography for the removal of humic and fulvic substances originating from soil or for the isolation of steroidal fraction (non-sapofiniable matter) from transesterified fat. To examine these techniques we sampled bones from individuals of different age and known date of death. Extracted fats were then separated to neutral (tri-, di- and monoacylglycerols) and steroidal fraction. An aliquot of the neutral fraction was then transesterified obtaining fatty acid methylesters (FAMES) which were subsequently separated by preparative GC system Agilent-Gerstel to obtain pure C16:0 and C18:0 FAMES. Isolated FAMES were then deesterified in acidic environment back to free fatty acids. Steroidal fraction was isolated by two approaches, either by sapofinication of extracted fat and isolation of non-sapofiniable matter or by eluting on micro-preparative silicagel filled glass column (micro-preparative column chromatography) using a suitable elution system. Purity of obtained analytes and solvents was examined by GC-FID (Flame Ionisation Detector) and GC-MS (Mass spectrometry) techniques. Further, all analytes were stripped off solvents quantitatively and processed for the purpose of measuring ^{14}C activity. The analytes were combusted to CO_2 which was subsequently graphitized by catalytic reduction using metallic zinc. Samples of graphites were then measured by AMS (Accelerator Mass Spectrometry) using a MICADAS system at Debrecen (Hungary). Preliminary results show, the isolation of fat fractions from bones, including steroidal fraction, could be useful for highly contaminated bone samples –by soil contamination or by plastificators from sample packaging. Nevertheless, the approach of sample processing should be considered for each sample separately.

Primary author: Dr BRYCHOVA, Veronika (Department of Radiation Dosimetry, Nuclear Physics Institute of the CAS, v. v. i.; Faculty of Food and Biochemical Technology, University of Chemistry and Technology Prague)

Co-authors: Mrs PETROVÁ, Markéta (Faculty of Food and Biochemical Technology, University of Chemistry and Technology, Prague); Dr SVETLIK, Ivo (Department of Radiation Dosimetry, Nuclear Physics Institute of the CAS, v. v. i.); Mr SIMEK, Pavel (Department of Radiation Dosimetry, Nuclear Physics Institute of the CAS, v. v. i.)

Presenter: Dr BRYCHOVA, Veronika (Department of Radiation Dosimetry, Nuclear Physics Institute of the CAS, v. v. i.; Faculty of Food and Biochemical Technology, University of Chemistry and Technology Prague)

Session Classification: Poster NAM

Track Classification: Nuclear Analytical Methods