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Analytical procedures for the determination of selected trace elements in age-dated peat profiles

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There is a growing interest in the use of peat bogs as archives of atmospheric metal deposition. However, accurate and precise analytical data are needed to provide reconstructions of atmospheric metal deposition rates. Thus, reliable analytical procedures for trace element analyses are a critical step in any such study. In this context, new robust and reliable analytical procedures for the determination of rare earth elements (REE) and of other selected trace elements of environmental interest in ancient peat samples have been developed and critically evaluated. Dissolution of the difficult-to-digest peat samples was achieved with an acid mixture containing HNO_3 and tetrafluoroboric acid (HBF_4) at 240 °C in a microwave high pressure autoclave. Thus forty samples could be simultaneously digested. Hydrofluoric acid (HF) which is normally used in the acid mixture to attack silicates present in the samples formed insoluble fluorides with many elements such as Ca and REE and thus resulted in poor recoveries of these elements. The replacement of HF by HBF_4 in the digestion mixture efficiently solved this problem by simultaneously attacking the silicates while preventing the precipitation of metal fluorides. Trace elements were subsequently determined in the diluted digestion solutions by inductively coupled plasma mass spectrometry (ICP-MS) equipped with an ultrasonic nebulizer with membrane desolvation or with a conventional pneumatic nebulizer. Strict quality control schemes were applied to guarantee the accuracy of the entire analytical procedure.
The new analytical procedures were applied to the determination of REE and other environmentally relevant elements such as Cu, Zn, V, Cr, Ni, Ag, Cd, Mo, Ba, Tl, Th and U in peat cores extending back more than 12,000 ^{14}C BP. Concentration profiles, enrichment factors as well as reasons for the anthropogenic and geochemical behaviour of selected elements will be discussed in detail.

References

Krachler M, Burow M, Emons H (1999), J. Environ. Monit. 1:477-481
Krachler M, Shotyk W, Emons H (2001), Anal. Chim. Acta 432:307-314
Krachler M, Mohl C, Emons H, Shotyk W (2002), J. Anal. At. Spectrom., in press
Krachler M, Mohl C, Emons H, Shotyk W (2002), Spectrochim. Acta B, submitted
Krachler M, Emons H, Cozzi G, Barbante C, Shotyk W (2002), Anal. Chim. Acta 458:387-396
Shotyk W, Krachler M, Martinez-Cortizas A, Cheburkin AK, Emons H (2002), Earth Planet. Sci. Lett. 199:21-37