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Measuring ^{36}Ar without H^{35}Cl interference

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Noble gas measurements are usually made in static mode, when the mass spectrometer sensitivity is inversely proportional to volume: this makes the building of very large instruments to obtain high mass resolution impracticable. A particularly challenging interference has hitherto been H^{35}Cl, which differs in mass from ^{36}Ar by 1 part in 3937. We have developed a method which makes improved use of the available MRP to remove interferences, and used it to obtain HCl-free ^{36}Ar measurements on a multicollector instrument with MRP of only $\sim$6000 (MRP= mass resolving power = m/dm 5-95% on side of peak).

By arranging that the target mass position on a minor isotope (e.g. ^{36}Ar), from which the interference must be removed, coincides with the $\sim$50% point on the side of a major isotope (e.g. ^{40}Ar), it is possible both to set the mass accurately and to verify the mass position and stability during measurements. The peak top of ^{40}Ar is measured in a separate mass step. Two small corrections are necessary. One compensates for the residual HCl tail at the ^{36}Ar position. The other arises because the peak is not totally flat in the region of interest: ^{40}Ar and ^{36}Ar+HCl are measured on the peak top, whilst ^{36}Ar is measured at the extreme edge, with slightly lower efficiency. The required correction parameters can be obtained from a series of air calibrations with different target/interference ratios. With samples containing 4x10^{-15}to 3x10^{-14}moles of ^{40}Ar, ^{36}Ar/^{40}Ar was measured, without HCl interference, to a 1σ precision of 0.5%, only slightly worse than counting statistics. This is potentially useful for ^{40}Ar/^{39}Ar dating, where ^{36}Ar is used to correct for trapped air, and may be particularly significant for smaller or younger samples.