

Calcium-41

Calcium is separated using a combination of precipitation, ion-exchange and extraction chromatography. The chemical recovery is determined by atomic absorption measurements before and after separation.

A suitable amount of the separated calcium is measured in a Quantulus liquid scintillation counter. Energy windows are set appropriate to measure calcium-41 and calcium-45.

No calcium-41 reference solution, certified in terms of concentration, is currently available. Solutions certified for calcium-40/calcium-41 atom % ratio *are* available. It is proposed one of these solutions is analysed for stable calcium by instrumental methods, and the absolute calcium-41 activity concentration derived from this and the certified isotope ratio. This in turn will allow the liquid scintillation counting efficiency to be found, albeit with a higher uncertainty than would normally be the case.

It is not reasonably possible to separate isotopes of the same element, beta particle emission energies are a continuum, and since the beta emission energy of calcium-45 is higher than that of calcium-41, the presence of calcium-45 will lead to a positive result for calcium-41. Results will be reported derived from the count rate in the calcium-41 energy window and the calcium-41 counting efficiency derived as above. Any positive results may not therefore be due entirely, or in part, to calcium-41 itself. However, they should give upper limits to the calcium-41 activity concentration.

Similarly, it is expected to be technically challenging to completely remove the high activities of certain other radionuclides from the calcium fraction. Reasonable efforts to achieve this will be made, in proportion to the person-hours implied by the analytical cost. But again, any positive results may not be due entirely, or in part, to calcium-41 or calcium-45 themselves. However, they should give upper limits to the calcium-41 or calcium-45 activity concentrations.