DGA-SHEETS technical note - separation of ^{227}Actinium equilibrium mixture - AEM

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Universal chromatographic system – paper impregnated with N,N,N',N'-Tetraoctyl Diglycolamide is an useful tool for various elements separation and may serve as validated QC method for radionuclide generators eluates and nuclides separation.

The ^{227}Ac is produced in a nuclear reactor and decays according to a scheme:

$$^{226}Ra(n,\gamma)^{227}Ra \xrightarrow[42min]{\beta^-} {}^{227}Ac$$

$$^{227}Ac \xrightarrow[22\ y]{\beta^-} {}^{227}Th \xrightarrow[18\ d]{\alpha} {}^{223}Ra \xrightarrow[11\ d]{\alpha} {}^{219}Rn \xrightarrow[4\ s]{\alpha} {}^{215}Po \xrightarrow[2\ ms]{\alpha} {}^{211}Pb \xrightarrow[36\ m]{\beta^-} {}^{211}Bi \xrightarrow[2\ m]{\alpha} {}^{207}Tl \xrightarrow[5\ m]{\beta^-} {}^{207}Pb$$

Thus ^{227}Ac may be separated from ^{226}Ra as well as ^{223}Ra from ^{227}Ac and ^{227}Th. Single 5 × 20 cm DGA-sheet was cut of 20 x20 cm bulk sheet and used for the separation of *AEM*. Mobile phase was the 1M HNO_3. Developed chromatographic sheet was measurement on a standard radio-TLC scanner (see **Fig.1**). Further, the sheet was re-measured repeatedly during one hour in the same position to allow to decay/growth the ^{211}Pb in the respective peaks of ^{211}Pb and ^{223}Ra. Finally the sheet was measured after the decay of ^{227}Th and ^{223}Ra in their respective peaks (one year after the separation) and so at the ^{227}Ac peak site the ingrowth of ^{227}Th and ^{223}Ra allowed its detection. In pure ^{223}Ra solution, no activity should remain in first half of the chromatogram.

Fig. 1. Separation of *AEM* using 5 × 20 cm DGA-sheet with 1M HNO_3 as a mobile phase. ^{227}Th remains on start, ^{227}Ac has a retention factor ≈ 0.2, ^{211}Pb ≈ 0.7 and ^{223}Ra ≈ 0.9.

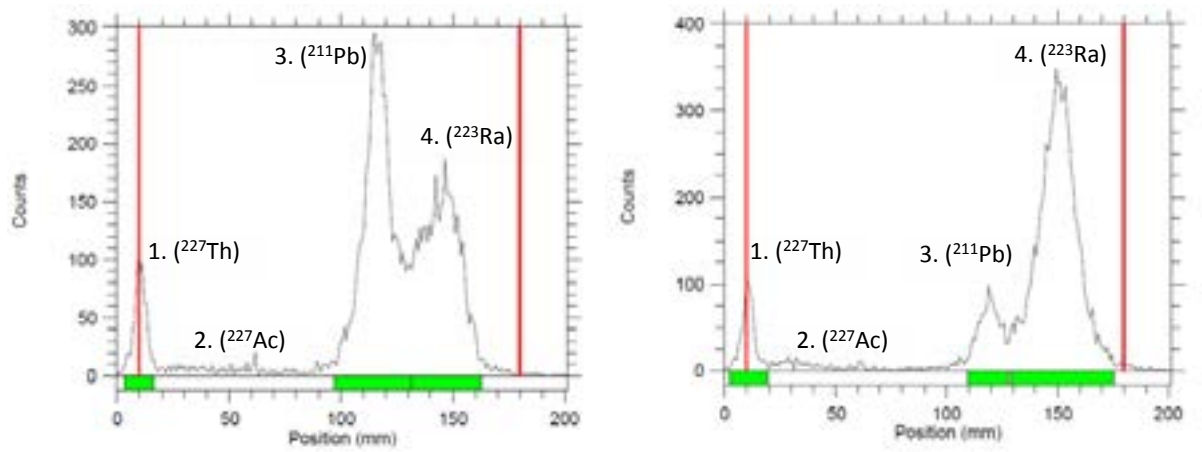

Fig. 2. Left: γ-spectrum of peak 2. (^{227}Ac in equilibrium with daughter nuclei); Right: Decay/ingrowth of ^{211}Pb in peaks 3./4.