The moisture effect on ^{223}Ra and ^{224}Ra measurements using Mn-cartridges

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Important processes in the ocean can be evaluated with radioactive nuclides, including radium isotopes. An approach for quantifying radium isotopes in seawater with in-situ pumps has been developed in advance of the GEOTRACES program [1]. Precise measurements of ^{223}Ra and ^{224}Ra by means of the delayed coincidence counting system (RaDeCC) [2] are dependent on the moisture content of the medium [3]. In order to verify the optimum moisture content for this new approach, a set of measurements of Mn-cartridge standards under different moisture conditions was conducted, as this was done previously for the acrylic fibre. At a time, an amount of water equivalent to 5% of the cartridges weight was added, and the activities were determined.

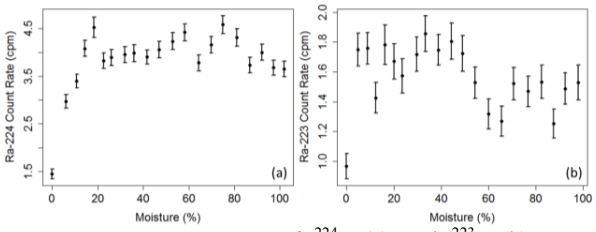

Figure 1. Count rates of ^{224}Ra(a) and ^{223}Ra(b) Mn-cartridge standards as a function moisture content.

The variation of ^{224}Ra activity occurs mainly between 0 to 15% of humidity. Under moisture conditions higher than 15%, the emanation efficiency reaches an optimum plateau until 100% of moisture. This result differs slightly from those found for ^{224}Ra measurements using the acrylic fiber [3].

The ^{223}Ra activity reaches the plateau under 5% of humidity, and above 50% of moisture the activity seems to decrease. Considering the counting error (7%), it is hard to state that the effect of the moisture is critical. However, this decrease can be related to the shorter half-life of the ^{219}Rn compared to the time needed to its diffusion through the water film, which could be a reason for the frequently observed lower efficiency of the ^{223}Ra channel.

[1] Henderson et al. (2013) J. Radioanal. Nucl. Chem. **296**, 357–362. [2] Moore and Arnold (1996) J. Geophys. Res. **101**, 321–1329. [3] Sun and Torgersen (1998) Mar. Chem. **61**, 163–171.