

Highlights of Analytical Sciences in Switzerland

Division of Analytical Sciences

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Fast Survey of Radiostrontium after an Emergency Incident Involving Ionizing Radiation

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Radio strontium

Radiostrontium (mainly ^{90}Sr) is one of the radionuclides that is emitted when nuclear fission gets out of control. The main source is from bomb fallout. Radiostrontium was released to the environment from 1945 to 1970, when over 600 bombs were tested in the atmosphere. Nuclear accidents, such as the nuclear power plants of Chernobyl or Fukushima-Daiji, are another source of this artificial radionuclide. ^{90}Sr has a half-life of 30 years and is known as a bone seeker. Therefore, it is important to obtain ^{90}Sr -data within a short time after an emergency incident. The focus is then on analyzing the drinking water.

We extract the ^{90}Sr directly from the water sample with an organic solvent. It contains the crown ether dicyclohexano-18-crown-6 as an extracting agent and didodecyl-naphthalene sulfonic acid as a scintillator. It is commercially available as STRONEX. 8 mL of this extracting solvent are sufficient to extract more than 70% of radiostrontium from a 1L water sample. Interfering β -nuclides (such as ^{140}Ba) are eliminated by a scavenge with barium chromate prior to the extraction. Three hours after sampling, the first ^{90}Sr results are available. Twenty samples can be analyzed within 24 hours when using one liquid



Nuclear power plant Fukushima-Daiji after the accident (photo TEPCO)

scintillation counter. With this method, it is possible to detect ^{90}Sr at a level of 0.1 Bq/L and higher. The working range is linear up to over 1'000 Bq/L.

Analysis of ^{90}Sr in drinking water by liquid/liquid extraction and β -spectrometry is fast and sensitive enough for emergency analyses. It is a reliable tool for the fast survey of drinking water after an emergency.

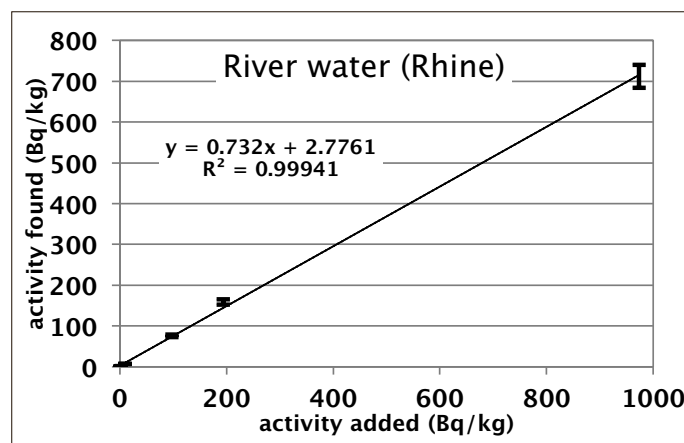
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Microseparator system for the separation of the upper STRONEX phase from the water sample (yellow). The STRONEX is drained with the valve to the right.



Recoveries of ^{90}Sr in river water (error bars are the relative standard deviation of the liquid scintillation counting).

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