

Title:

Adsorption of ^{90}Sr on biofilms and materials found in water distribution systems

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Abstract:

Water distribution networks can be potential targets for a malevolent act. *Security and decontamination of drinking water distribution systems following a deliberate contamination* (SecurEau) is a research project supported by the European Commission under the Seventh Framework Programme. Chemical, biological, radiological and nuclear contaminants (CBRN) are studied in the project with respect to their identification, detection, transport and decontamination. Our study contributes to the project through studying the behaviour of radionuclides in water networks. This paper concentrates on the adsorption of ^{90}Sr on the surfaces of pipe materials as well as on biofilms inside the pipes.

In water distribution networks, several materials are used, e.g. polyethylenes, metals, PVC, asbestos cement and EPDM rubber. Under normal conditions all these pipe materials are partially covered by natural biofilms. Different types of precipitates (e.g. carbonates, hydroxides) are also found depending on the water characteristics. Adsorption kinetics on six materials (PE, HDPE, PE-xA, EPDM, stainless steel and PVC) was tested in non-flow conditions using normal tap water spiked with radionuclides. Same experiments were repeated with materials on which biofilms had been formed. We also set up bioreactors under flow conditions simulating household water pipes (stainless steel, PE-xA and copper) where biofilms were allowed to grow for four weeks before spiking with ^{90}Sr -containing tap water. The results concerning strontium accumulation on pipe materials and biofilms under the tested conditions, and on ferric mineral-containing biofilms will be discussed.