



ID:

Type: Oral

Characterization of filters from German and Sweden radiological monitoring networks with Ru-106 from 2017

Thursday, 27 June 2019 18:45 (15 minutes)

In late September and early October 2017, the International Monitoring System and several national radiation surveillance networks in Eastern and Western Europe reported low levels of the airborne radionuclide contaminants ruthenium-106 and ruthenium-103, with both species being CTBT relevant. Filters from the national networks of Sweden operated by the Swedish Defence Research Agency, Totalförsvarets forskningsinstitut (FOI), and of Germany operated by the German meteorological services Deutscher Wetterdienst (DWD) containing ruthenium-106 were characterized physically, including coincident gamma high resolution gamma spectroscopy, electron microscopy, autoradiography, and species solubility. The filters were very radiopure, with no other radioisotope component in excess of 0.002 fraction of the ruthenium activity. Electron microscopy and autoradiography indicate the ruthenium was highly dispersed in domains likely less than a micron in size. Solubilization studies discount the possibility of ruthenium existing as tetroxide (RuO₄) on the filter and demonstrate that 50 to 60% of the species present can be extracted in polar solvents including water. The initial conditions of the aerosolized material prior to dispersal are considered in a discussion of this important CTBT verification scenario, including the analytical techniques available for event characterization.

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Session Classification: T2.1 Characterization of Treaty-Relevant Events

Track Classification: Theme 2. Events and Nuclear Test Sites