

Title	Experimental study on iodine chemistry (EXSI) – Containment experiments with methyl iodide
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Abstract	<p>An experimental study on radiolytic decomposition of methyl iodide was conducted in co-operation between VTT and Chalmers University of Technology as a part of the NKS-R programs.</p> <p>In year 2008 the NROI project, a Nordic collaboration studying iodine chemistry in the containment, was started. During year 2008 (NROI-1) the radiolytic oxidation of elemental iodine was investigated and during 2009 (NROI-2), the radiolytic oxidation of organic iodine was studied. This project (NROI-3) is a continuation of the investigation of the oxidation of organic iodine. The project has been divided into two parts. 1. The aims of the first part were to investigate the effect of ozone and UV-radiation, in dry and humid conditions, on methyl iodide. 2. The second project was about gamma radiation (~20 kGy/h) and methyl iodide in dry and humid conditions.</p> <p>1. Experimental results showed that the methyl iodide concentration in the facility was reduced with increasing temperature and increasing UV-radiation intensity. Similar behaviour occurred when ozone was present in the system. Formed organic gas species during the decomposition of methyl iodide was mainly formaldehyde and methanol.</p> <p>The particle formation was instant and extensive when methyl iodide was exposed to ozone and/or radiation at all temperatures. The size of the formed primary particles was about 10 nm and the size of secondary particles was between 50-200 nm. From the SEM-EDX analyses of the particles, the conclusion was drawn that these were some kind of iodine oxides (I_xO_y). However, the correct speciation of the formed particles was difficult to obtain because the particles melted and fused together under the electron beam.</p> <p>2. The results from this sub-project are more inconsistent and hard to interpret. The particle formation was significant lesser than corresponding experiments when ozone/UV-radiation was used instead of gamma radiation. The transport of gaseous methyl iodide through the facility was much lower than expected for some unknown reason. A “new” reaction product in this kind of experiments was detected, namely iodoform (CHI_3), but the data is rather uncertain.</p>
Key words	severe accidents, iodine, aerosols, methyl iodide, radiolytic oxidation