

Title	Experimental study on iodine chemistry (EXSI) – Containment experiments with methyl iodide
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ISBN	978-87-7893-290-7
Date	May 2010
Project	NKS-R / NROI
No. of pages	19
No. of tables	2
No. of illustrations	13
No. of references	11
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>The behaviour of iodine during a severe accident has been studied in several experimental programs, ranging from the large-scale PHEBUS FP tests and intermediate-scale ThAI tests to numerous separate effect studies. In year 2008 the NROI project, a Nordic collaboration studying iodine chemistry in the containment was started. During 2009, oxidation of iodine, especially organic iodine, was studied within the NROI project. The chemistry of organic iodine in the gas phase is still one of the greatest remaining uncertainties concerning iodine behaviour during a severe accident.</p> <p>During the first year of the NROI project the oxidation of elemental iodine, I₂, with ozone and UV-light was investigated. In this study organic iodide, in this case methyl iodide, was investigated in similar conditions as in the NROI-1 project. The experimental facility applied in this study is based on the sampling system built at VTT for the ISTP project CHIP conducted by IRSN. The experimental facility and the measuring technology are sophisticated and unique in the area of nuclear research as well as in the field of aerosol science.</p> <p>Experimental results showed that the methyl iodide concentration in the facility was reduced with increasing temperature and increasing UVC 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>Instant and extensive particle formation occurred when methyl iodide was transported through a UVC radiation field and/or when ozone was present. The size of the formed primary particles was about 10 nm and the size of secondary particles was between 50-150 nm. From the SEM-EDX analyses of the particles, the conclusion was drawn that these were some kind of iodine oxides (I_xO_y). The exact speciation of the formed particles was, however, difficult to obtain because the particles melted and fused together under the electron beam.</p>
Key words	Methyl iodide, nuclear safety, severe accident, containment, ozone