

High temperature interaction between MoO₃ and CsI, in highly humidified air

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Abstract

In the event of a nuclear accident, one of the more worrying fission product is iodine. Especially, considering that iodine in the body accumulates in the thyroids and with its high specific activity could subject a person to a considerable dose. Therefore, it is important to have an accurate estimate of the release of iodine during an accident.

It has been indicated that molybdenum is capable, under oxidizing conditions, to affect the iodine source term. This occurs through the interaction with cesium iodide and formation of different types of cesium molybdates. Previously it has been observed that when molybdenum trioxide is present together with cesium iodide in a steamy argon atmosphere at high temperature, molybdenum reacts with the cesium part and consequently releases gaseous iodine. This would mean an increase in the iodine source term. However, a question that remains is what happens in a steamy air atmosphere at a high temperature (e.g. an air ingress scenario) when molybdenum and cesium iodide are present.

In this work, molybdenum trioxide (later also: molybdenum metal, molybdenum dioxide) was heated to 1470 K where it was subjected to a flow (1.5 l/min) of air saturated with water and an additive. This was achieved using an atomizer, which was filled with water and dissolved cesium iodide (the additive). This allowed the air to become saturated (100% RH, measured without the additive) and transport the cesium iodide to the heated zone. Afterward, the flow was cooled down rapidly to room temperature, by extending the tube far outside the tube, where aerosols are collected on a filter and gaseous species (mainly iodide) in sodium hydroxide traps.

The preliminary findings are that cesium molybdate does form under highly humid air at high temperature. However, in these conditions, the speciation that remains at room temperature is a mixture of different molybdenum oxides and cesium molybdates (not only Cs₂MoO₄). Thus, it could be possible that a variety of cesium molybdates.

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