



# **Investigation and Corrective Action**

## **Standard Investigation Report**

**Incident ID: 122560 (Supervisor Report)**

### **Incident Information**



## Incident Details

### Incident Title:

Radiation Spill

### Date:

Oct 04, 2018

### Time:

6:30 PM

### Building:

OK - EME - Engineering  
/Management/Education

### Description of Incident Location:

EME1205

### Accident Type:

Contact with Radiation

### Injury Type:

No Injuries

### Describe fully what happened before, during, and after the incident (please do not include names or personal information):

ORIGINAL E\_MAIL TO UBC RADIATION SAFETY OFFICER: Hello: As per our lab procedures, I would like to report a spill of thoria in our lab. Two grad students were conducting experiments in my lab (EME1205) today (6:40 pm) with sintering (i.e., high temperature processing) of thoria powder. The loose powder is typically placed into an air-tight graphite die. Then, the graphite die is inserted into a sintering chamber. The sintering chamber is then sealed and the material is "cooked" to turn it from powder to a bulk solid material. During the process, unfortunately, the graphite die broke (we don't know why). As a result, the 5g of thoria powder has spilled inside of the sintering chamber. The chamber is sealed and isolated, therefore there is no possibility of a leak from the chamber. The chamber is made of steel. The lab is locked-down and nobody will enter the lab until the spill is cleaned. Tomorrow (Friday), one of the grad students and I will clean the chamber. We are planning to put on a full-body suit, respirators, goggles, face shields. The sintering chamber will be sprayed with alcohol, to trap the thoria powder in solution and prevent it from going airborne. Then, the chamber will be carefully wiped. The surrounding area of the sintering chamber will be also cleaned. After this, we will do wipe tests to confirm that all was cleaned OK. We also have alpha and gamma survey meters. All wipes, gloves, and also the body suits will be disposed of in our contaminated waste. Please let me know if you have any concerns about this situation. If you would need to talk to me, my cellphone number is \_\_\_-\_\_\_-\_\_\_. Thank you. UPDATE TO UBC RADIATION SAFETY OFFICER (FRIDAY, 5:20 PM) Hello: I just wanted to send you a quick update about the cleanup of our sintering chamber and the spilled thoria powder. A grad student and I have suited up and wiped the chamber as best as we could. There were no "surprises". At the end, the grad student just performed a wipe test. The BACKGROUND was 306 cpm, which is a bit high. We have taken 13 wipe tests around the chamber. In most of the wipes, the readings were < 100 cpm. There were two locations where the wipe test yielded 750 and the other 650 cpm (this was in an area where a copper plate is in the sintering chamber). At this point, we have closed the chamber and we will re-do wipe tests on Tuesday morning to see if the residual radiation resides. If not, then we will repeat the cleaning experiment. We talked to UBC Campus Security, and they were not able to revoke Salto access for the weekend. As a result, they have placed a "CAUTION" tape across the doors. We have also included several "Do not enter" signs on the doors. We are going to fill-out the incident report on CAIRS right now. Thank you and have a good weekend.

## Accident Investigation

### Task Related Causes



**No "Task" Causes**

**Environment Related Causes**

**No "Environment" causes**

**Equipment Related Causes**

<input checked="" type="checkbox"/> <b>Material / equipment failure</b>	
---	--

**Organizational Related Root Causes**

<input checked="" type="checkbox"/> <b>Poor job design / work layout</b>	
--	--

**Human Related Root Causes**

**No "Human" related causes**

**Root cause**

**Incorporating the above factors, determine and describe the root cause of the incident or accident:**  
 initial suspected cause:A graphite die in our Spark Plasma Sintering machine broke during an experiment. The die contained 5g of Thorium oxide. The thoria powder spilled inside of a sealed chamber. The chamber was cleaned-up. Upon further examination: The die did not break as first suspected. the die consists of an outer housing and two pistons. the pistons are inserted into the hollow housing and forces are applies to the piston to compress the powder material. to ensure a good seal is established between the piston and the housing graphite sheets are used. a tear in one of these graphite sheets allowed for the escape of material. When running the system with nonradioactive material 1 sheet is used. 2 sheets are used in radioactive experiments to ensure a very good seal is established. 2 sheets were used in this test, but the rip allowed for material escape.

**Corrective Actions**

**Corrective Action to prevent recurrence of similar incidents (1)**

**Corrective Action Identified:**  
Machine clean-up.

<b>Assigned to (name):</b> L. Bichler and A. Prasad	<b>Job title:</b> Associate Professor and Graduate student
--	---

**Final Actions Taken:**  
Machine was cleaned. Follow-up wipe tests to be done on Tuesday, October 9, 2018.

<b>Date to be Completed:</b> 2018-10-05	<b>Date Completed:</b> 2018-10-05	
--	--------------------------------------	--

**JOHSC/LST Additional Action to prevent recurrence of similar incidents (1)**



**Follow-up Item:**

Security unable to secure the lab via deactivation of Salto access. Recommend providing training and equipment so rooms can be locked out completely in the event of an emergency.

<b>Assigned to (name):</b>	<b>JOHSC or LST Membership (JOHS Committee or Local Safety Team you are following from):</b>
----------------------------	--

**Final Actions Taken:**

<b>Date to be Completed:</b>	<b>Date Completed:</b>	
------------------------------	------------------------	--

**JOHSC/LST Additional Action to prevent recurrence of similar incidents (2)**

**Follow-up Item:**

the task of assembling the die is conducted in a glove box. Dexterity is not achievable due to the gloves in the glove box. It is very difficult to assemble the die, and this is where the tear would have occurred. Providing a proper fume hood for assembling the die would allow for more precision in the assembly reducing the likelihood of a tear.

<b>Assigned to (name):</b>	<b>JOHSC or LST Membership (JOHS Committee or Local Safety Team you are following from):</b>
----------------------------	--

**Final Actions Taken:**

<b>Date to be Completed:</b>	<b>Date Completed:</b>	
------------------------------	------------------------	--