

Lessons Learned

Plastic Secondary Container Shatters Due to Dry Ice Sublimation

What Happened?

A researcher packaged a microgram crystalline sample with dry ice to ensure sample integrity. The crystalline sample was first placed inside a glass vial, which was subsequently housed inside a plastic secondary container with a screw cap. The researcher placed dry ice around the glass vial inside the secondary container before loosely capping the top to vent.

When it came time to take out the glass vial, the researcher found that the secondary container was stuck, even though the cap was originally loosely screwed.

The researcher recruited the help of a staff member to unscrew the secondary container. With each individual holding one end of the container, the two tried to screw it open. In the process, the secondary container blew apart with a very loud popping sound, shattering both secondary container and glass vial. All contents impelled outwards. Glass shards impinged on the staff member's face and on his regular prescription glasses. Both researcher and staff member reported hearing short term ringing in their ears as a result of the shattering.



Photo 1 – Shattered Secondary Plastic Container

What went right?

- The injured staff member was accompanied to the nearest medical facility immediately and followed appropriate reporting procedures to UC Berkeley personnel, including the Office of Environment, Health & Safety.

What should have been done differently?

- An insulated material with a loose lid should have been used as a secondary container, as opposed to plastic, which tends to become brittle and possibly break as it cools.
- A container with a lid that is designed to vent, rather than a screw cap, should have been used as a secondary vessel. It is possible that water vapor condensed around the edges of the screw cap, fusing the threads together, which made it difficult to open.

What was the cause of the container shattering?

Dry ice sublimates under normal temperature and pressure conditions. In this case, sublimation of dry ice led to gas buildup and overpressurization of the secondary container. In addition, the low temperature of dry ice likely condensed water vapor within the threads of the screw cap, causing the plastic material to weaken and fuse together. The container shattered due to the buildup of gases within a weakened plastic material.

What corrective actions have been taken?

The College of Chemistry, where the incident took place, is advising researchers to use appropriate packing materials for transport purposes.

Researchers utilizing instrumentation in core facilities have been strongly advised to wear protective eyewear, even when not performing bench chemistry procedures.

Lessons Learned

This incident highlights the importance of using appropriate materials to enclose and transport samples alongside dry ice. To prevent similar incidents, follow the guidelines below:

- Utilize insulated materials (such as styrofoam) with loose or vented lids when packing samples with dry ice.
- Do not force open containers that appear to be overpressurized.
- Wear proper protective equipment when working inside the laboratory or core facilities.

For additional assistance, contact EH&S at ehs@berkeley.edu or (510) 642-3073, Lessons Learned date: May, 2019

Additional Photos



Photo 2 – Scratched Prescription Glasses