



The University of Akron
OHIO's POLYTECHNIC UNIVERSITY
College of Polymer Science
and Polymer Engineering

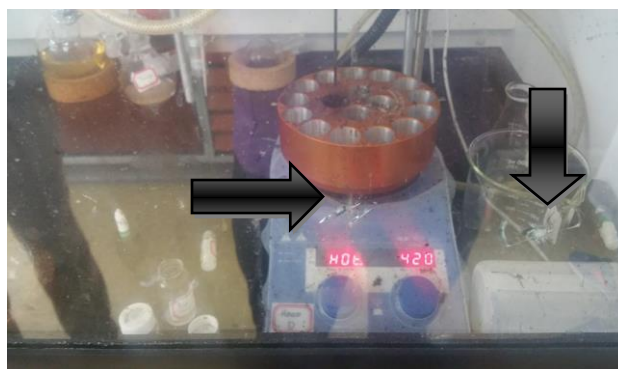
Office of Operations - Safety Office

LESSONS LEARNED

September 2017 – Ampoule Explosion

What happened?

A post-doctoral researcher was conducting a copolymerization of 2-methyl-2-oxazoline (4mL) and citraconic anhydride (4.2mL) in a 40 mL PTFE-tapped glass ampoule. This ampoule was prepared inside a nitrogen atmosphere glovebox at room temperature then moved to be heated inside the hood. It is standard practice to heat reaction at temperatures 80° to 120 °C. Within 5 minutes of heating, the polymerization reached an exotherm and rapidly increased in temperature as a consequence of the autocatalysis. This caused the nitrogen to expand and the glass ampoule failed. The force of explosion cracked the hood sash in several places. **It is the commendable safe practices of this post-doctoral researcher to work with the hood sash in the closed position which prevented injuries or further damage in the lab.**



What was the cause?

The nitrogen gas expanded during the heating process increasing the pressure inside the ampoule causing catastrophic failure.

What went wrong?

- Having to use the hotplate to heat the reaction promoted autocatalysis which increased temperature and pressure forcing the ampoule beyond a critical level.

What went right?

- Researcher was wearing safety glasses, lab coat and gloves.
- Researcher was working with the hood sash closed...the safest working position.
- EOHS/Safety and PI were contacted immediately.
- Researcher used the correct glassware for the experiment.
- There were no injuries or further damage to the lab.

What corrective action was taken?

- The experiment will be conducted inside a glovebox in room temperature.
- Using a blast shield in a hood utilizing a sealed ampoule with enough head space at room temperature would also be a safer alternative.

Resources:

Related literature to the chosen temperature: <http://pubs.acs.org/doi/pdf/10.1021/ma00121a002>