Brookhaven National Laboratory

U.S. DEPARTMENT OF ENERGY

TAKE FIVE for Safety- Recent Storage Cabinet Fire Event

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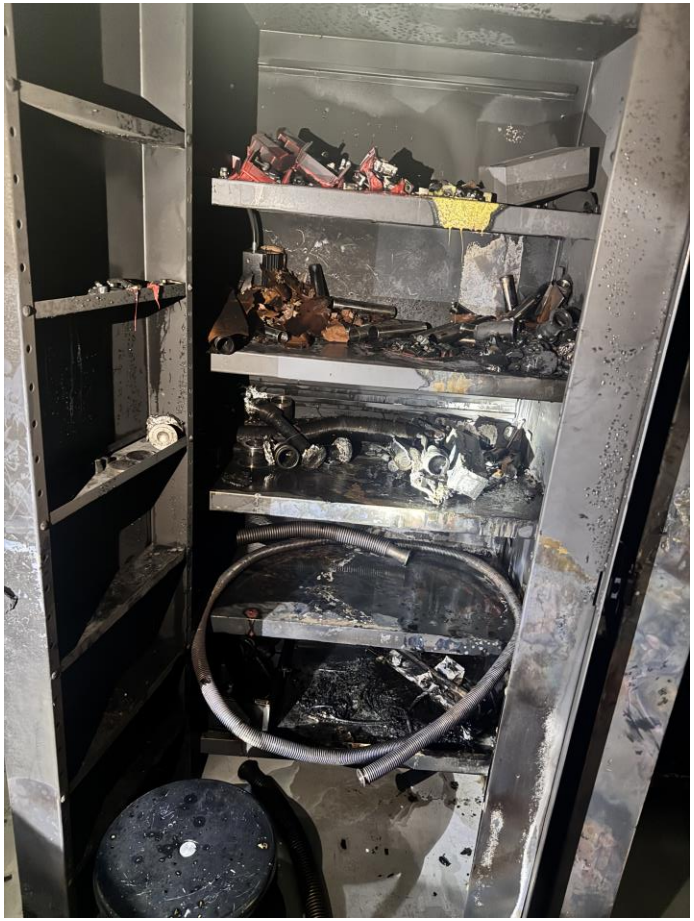
Vacuum Component Storage Cabinet Fire (Reporting Level H)

- On June 14, 2025, a fire alarm was activated in Building 382.
- The Fire Department responded, identified smoke, and extinguished the fire.
- Preliminary investigations suggest the fire originated in cabinets containing battery operated tools and vacuum components.
- There is no structural damage to the building.
- Fire crews are investigating the source of the fire and the potential for fire spread.
- No injuries were reported, and there was no environmental impact.
- Damage was confined to equipment and supplies.

Initial Incident Overview:

- The fire originated in a center thick metal cabinet containing both **non-evaporable getter (NEG)** material and particle counters equipped with a power tool that had a lithium-ion and nickel battery.
- While the exact ignition source remains undetermined, the combination of flammable solids and battery-powered equipment within the same cabinet posed a significant hazard.
- Importantly:
  - No personnel were injured
  - There was no radiological contamination
  - Damage was confined to an area of approximately 20 square feet
- A sprinkler head located in a “clean room” area, surrounded by plastic curtains and situated behind the affected cabinet, was activated
- The Fire Department is conducting a separate investigation to determine the ignition source.

Damaged Cabinet Pictures



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“Key Considerations” from Initial Report:

- Material Interactions: Lithium-ion batteries are known ignition sources. NEG material, though stable under typical conditions, can act as a fuel source when ignited. Storing these materials together increased the event's potential severity.
- Storage Practices: NEG material was stored in plastic buckets and metal cans within a metal cabinet. While contained, these methods may not meet best practices for long-term or flammable solid storage. The manufacturer recommends storing NEG material under vacuum or in a dry environment for "prolonged storage," though no specific timeframe is defined.
- Inspection Gaps: While regular safety inspections are conducted in Bldg. 382, they do not currently include comprehensive reviews for legacy chemicals or material compatibility. Additional resources are being considered to support a more thorough review.

Hazard and Storage Information from the Safety Data Sheet

Dangerous components:

Zirconium powder (non pyrophoric)	25-90%
Titanium	25-50%

Hazard Designation

Highly Flammable

Handling

Information for safe handling:

Prevent formation of dust.

Information about protection against explosions and fires:

Keep ignition sources away - Do not smoke.

Storage

Requirements to be met by storerooms and containers:

No special requirements.

Information about storage in one common storage facility:

Not required

Further information about storage conditions:

Keep container tightly sealed.

Store in cool, dry conditions in well sealed containers.

RECOMMENDED ACTIONS

Review and Update Storage Protocols: Laboratories should review and update their storage protocols for NEG to ensure compliance with safety guidelines. This includes storing NEG in metal storage cabinets that are free from ignition sources.

Implement Regular Inspections: Conduct regular inspections of storage areas to identify and rectify any potential hazards, such as the presence of incompatible materials or improper storage conditions.

Enhance Training and Awareness: Provide training for laboratory personnel on the proper storage and handling of NEG, emphasizing the importance of following safety guidelines and recognizing potential hazards.

Conduct Extent of Condition Reviews: Perform a comprehensive review of all storage areas within the laboratory to identify any other materials that may pose similar risks and ensure they are stored safely.

Dispose of Unused Materials: Establish a protocol for the timely disposal of unused or outdated NEG to minimize the risk of accumulation and potential hazards.

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Argonne

OPERATING EXPERIENCE LESSONS LEARNED

Enhancing Safety through Proper Storage of Getter Materials: Mitigating Risks for Laboratory Facilities

This article describes the importance of proper storage conditions for getter materials, such as non-evaporable getters (NEG), highlighting the risks associated with their flammable properties and the need for adherence to safety guidelines to prevent potential hazards in laboratory settings.

LESSONS LEARNED STATEMENT

Ensure NEG is stored under appropriate conditions to prevent potential hazards and preserve their performance. Improper storage of NEG can lead to safety risks due to their flammable properties. By adhering to recommended storage guidelines, laboratories can avoid accidents and ensure the safety of personnel and facilities.

ANALYSIS

NEG materials play a critical role in laboratory environments due to their ability to absorb residual gases and maintain vacuum conditions for accelerators. These materials are often composed of reactive metals like zirconium, which can pose significant safety risks, including fire, gas release, or contamination if not stored correctly. The inherent flammable properties of getter materials necessitate careful consideration of their storage conditions to prevent accidental ignition and ensure laboratory safety.

Photo 1: Stored NEG material

The key safety principles for storing NEG materials are: keep them dry, cool (temps below 50 °C (122 °F) are consider safe for the material to be exposed to air), and tightly sealed; store them away from water and heat sources; and handle with care to prevent dust generation or physical damage. Proper storage involves using containers that can withstand the reactive nature of these materials. Metal storage cabinets are recommended as they provide a robust barrier. It is also crucial to avoid storing getter materials alongside potential ignition sources, such as lithium-ion batteries or electronic devices, which could trigger a reaction if a fault occurs.

Understanding the chemical properties of NEG is essential for determining the appropriate storage environment. Manufacturers often recommend storing these NEG under vacuum or in an inert atmosphere to minimize the risk of spontaneous combustion. Moisture exposure is dangerous not only to performance but because it can produce flammable gas. Contact with water (even high humidity) will slowly oxidize the getter and can release hydrogen gas as a byproduct. Storing NEG under vacuum or in an inert atmosphere stabilizes its reactive components and prevents contact with atmospheric oxygen or moisture, reducing the risk of hazardous situations.

By being mindful of these storage requirements and regularly reviewing safety protocols, laboratories can effectively mitigate the risks associated with NEG. This proactive approach not only protects personnel and facilities but also ensures the longevity and effectiveness of the materials themselves.

RECOMMENDED ACTIONS

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- **Implement Regular Inspections:** Conduct regular inspections of storage areas to identify and rectify any potential hazards, such as the presence of incompatible materials or improper storage conditions.
- **Enhance Training and Awareness:** Provide training for laboratory personnel on the proper storage and handling of NEG, emphasizing the importance of following safety guidelines and recognizing potential hazards.
- **Conduct Extent of Condition Reviews:** Perform a comprehensive review of all storage areas within the laboratory to identify any other materials that may pose similar risks and ensure they are stored safely.
- **Dispose of Unused Materials:** Establish a protocol for the timely disposal of unused or outdated NEG to minimize the risk of accumulation and potential hazards.

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