

Best Practice Briefing

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Title: The A to Zs of Chemical Storage: Don't Alphabetize

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Best Practice:

Anyone who has watched a fireworks display or seen the launch of a shuttle has seen how violent and dangerous chemical reactions can be. In the laboratory, we try to control these reactions under careful conditions to safely achieve the desired research results. But what about the chemicals that are sitting in our cabinets, waiting to be precisely measured out and carefully reacted? In an earthquake, fire, or other accident scenario, the uncontrolled mixing of reactive chemicals could make a bad situation much, much worse. So what can we do to prevent unintended, violent chemical reactions from happening to our stored chemicals?

Whenever we have a large number of items to organize and store, one of our first instincts is to alphabetize them. We might alphabetize our bookshelves by author, or put our spices in alphabetical order. This is a great way to find things quickly and easily. But unfortunately, when it comes to chemicals, materials that are right next to each other alphabetically may be violently incompatible. For example, you may end up with hydrazine sitting right next to hydrogen peroxide. The uncontrolled reaction between strongly oxidizing hydrogen peroxide and the reducing agent hydrazine could be uncomfortably reminiscent of the aforementioned shuttle launch. It is important to sort chemical inventories first and foremost by their reactivity toward other materials. LBNL policy requires the following minimum segregation:

- Segregate acids from bases
- Segregate acids from reactive metals (e.g., Na, Mg, K)
- Segregate oxidizing acids (e.g., HNO₃ or HClO₃) from organic acids
- Segregate nitric acid from all other acids
- Segregate oxidizing materials from flammable and combustible materials (whether liquid or solid)

- Segregate acids from materials that can generate toxic or flammable gases on contact (cyanide salts, organic cyanides/nitriles, metal sulfides, thiols, metal carbides, etc.)
- Segregate alkali metals from halogenated hydrocarbons
- Segregate pyrophoric materials from flammable and combustible liquids

Segregation doesn't have to mean separate cabinets entirely, although that is the safest form of segregation. The easiest way to accomplish segregation within one storage cabinet is to keep each reactivity group in its own secondary containment tray or on its own shelf. For example, you might have a tray in your acid cabinet dedicated to nitric acid and another tray dedicated to perchloric acid. In your flammable cabinet, you might have a separate shelf for organic acids, and another separate shelf for organic bases. For solid chemical storage, it is very common to have a plastic bin or tray that keeps oxidizers separate from all other solid chemicals.

Chemical storage in general can be challenging, especially with the large variety of different chemicals available in the laboratory. Work Process K of the Chemical Hygiene and Safety Plan is dedicated to chemical storage and segregation and covers the essentials. To see chemical segregation broken down in an easy to navigate web page, go to <https://sites.google.com/a/lbl.gov/chemical-storage/>. Also keep an eye out for convenient chemical segregation posters coming soon. Contact your Health and Safety Representative or your Division Safety Coordinator for additional help and guidance.

Lessons Learned are part of the ISM Core Function 5, Feedback and Improvement. Applicable Lessons Learned are to be considered during working planning activities and incorporated in work processes, prior to performing work.

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