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Laboratório de Referência do Estado para Investigação de
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Experiments involving high risk hazards

高危化學實驗管理

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General Warning



High voltage



**Dangerous
chemicals**



Toxic

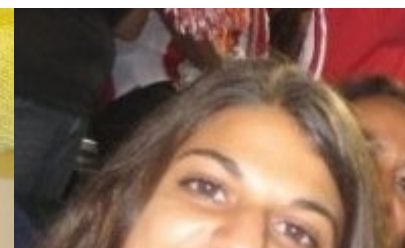


Biohazard

All chemicals are dangerous!



Karen Wetterhahn
Dimethylmercury



Sheri Sangji
Tert-butyllithium



Texas Tech Lab
nickel hydrazine perchlorate 高氯酸镍肼



致2死1傷，1人重傷。

- 6、2015年12月18日，天津濱海區一民房發生爆炸，致2死1傷。
- 7、2018年12月26日，天津濱海區一民房發生爆炸，導致1死1傷。
- 8、2021年3月31日，天津濱海區一民房發生爆炸，致1名研究生顱骨碎裂。
- 9、2021年10月24日，天津濱海區一民房發生爆炸，致1死1傷。
- 10、2022年4月20日，天津濱海區一民房發生爆炸，致1死1傷，1人重傷。



致1死1傷。

致1死1傷。

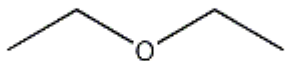
致1死1傷。

致1死1傷。

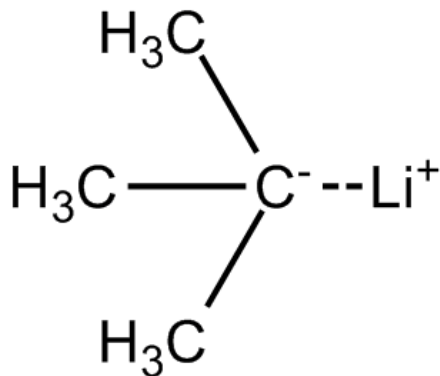
致1死1傷。

high risk hazards (高危化學品)

1. Ethyl ether (使用低沸點易燃品乙醚的反應)



2. *tert*-Butyllithium, triethylaluminum, lithium aluminium hydride, calcium hydride (一級易燃易爆藥品叔丁基鋰、三乙基鋁、四氫鋰鋁 (LAH)、氫化鈣反應)



3. Reaction involving highly toxic gas (使用劇毒氣體的反應)

- ❑ Irritant gas (刺激性氣體), such as octafluoroisobutylene (八氟異丁烯)、hydrogenfluoride (氟化氫)、sulfur dioxide (二氧化硫)、sulphur trioxide (三氧化硫), dimethyl sulfate (硫酸二甲酯), et al.
- ❑ Asphyxiant gas (窒息性氣體), such as nitrogen, methane, carbon monoxide, nitrobenzene (硝基苯), sulphur hexafluoride (六氟化硫), et al.



4. Sodium cyanide, potassium cyanide, hydrogen cyanide, Extremely poisonous, skin exposure, inhalation, or swallowing trace amount causes death.

NaNH_2 , Li-NH_3 、 Na-NH_3

NaNH_2 reacts violently with water to generate sodium hydroxide and ammonia. If the color turns yellow, it becomes azide and cannot be used to prevent explosion (NaNH_2 遇水分解反應劇烈，生成氫氧化鈉和氨。如色澤變黃，即變為疊氮化物不可再用，以防發生爆炸)



5. NaN_3 , diazotization reaction (重氮化反應)

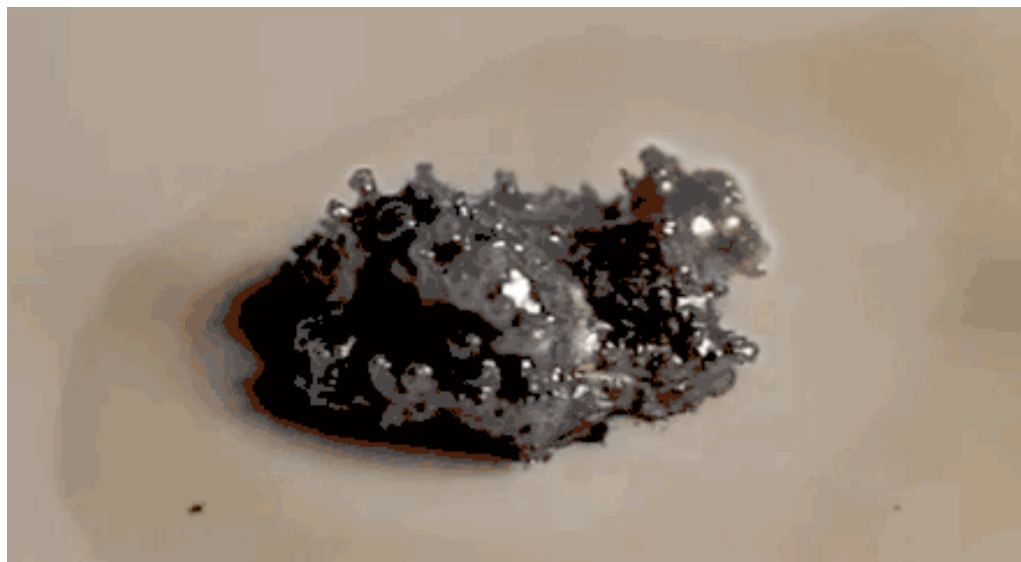
Dry NaN_3 and diazonium salts can explode under conditions of vibration, friction, heating or electric shock. Drying of NaN_3 and diazonium salt should be avoided. Take special care not to spill the reaction solution (乾燥的 NaN_3 、重氮鹽可在震動、摩擦、加熱或電擊的條件下發生爆炸。實際操作中應避免對 NaN_3 、重氮鹽進行乾燥。特別注意不要將反應液灑出，導致乾燥重氮鹽的產生)



6. Oxidation reactions using peroxides (使用過氧化物的氧化反應)

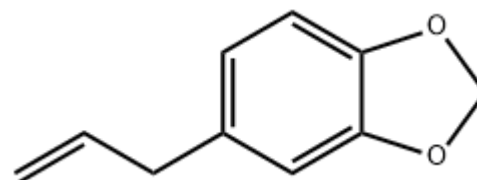
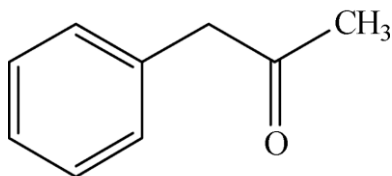
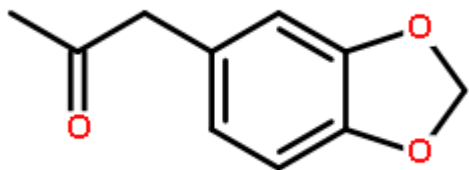
Peroxide is sensitive to heavy metals, light, heat and amines, and the decomposition reaction is an explosive autocatalytic reaction. Therefore, it is necessary to select a suitable storage environment (過氧化物對重金屬、光、熱及胺類都是敏感的，分解反應為爆炸性的自催化反應，因此使用時需根據實際情況，選擇適宜的儲存環境)

7. Alkali metal: Na、Li、K



8. narcotic drugs

Drug precursors control list: ephedrine (麻黃素), 3,4-methylenedioxyphenyl-2-propanone (3,4-亞甲基二氧苯基-2-丙酮), 1-phenyl-2-propanone (1-苯基-2-丙酮), phenyl acetic acid (苯乙酸), piperonal (胡椒醛), safrole (黃樟腦), isosafrole (異黃樟腦), acetic anhydride (醋酸酐), acyl chloride (酰氯)



9. Strong acids, strong bases, strong oxidizing agents, strong reducing agents

10. Gas participation and formation reaction, pressure reaction

11. High or low temperature reactions

12. Heavy metal: lead, mercury, cadmium, arsenic
radioactive isotopes: ^{13}N , ^{32}P , ^{131}I



Radioactive Isotope	Applications in Medicine
Cobalt-60	Radiation therapy to prevent cancer
Iodine-131	Locate brain tumors, monitor cardiac, liver and thyroid activity
Carbon-14	Study metabolism changes for patients with diabetes, gout and anemia
Carbon-11	Tagged onto glucose to monitor organs during a PET scan
Sodium-24	Study blood circulation
Thallium-201	Determine damage in heart tissue, detection of tumors
Technetium-99m	Locate brain tumors and damaged heart cells, radiotracer in medical diagnostics (imaging of organs and blood flow studies)

Operating principles

- Before the experiment, carefully check the MSDS of the chemicals, read related literatures to fully understand the possible dangers during the experiment (實驗前必須查詢所用化學品的MSDS, 認真查閱文獻, 瞭解實驗過程中可能出現的危險性)
- Make full preparations before the experiment, wear protective clothing, protective goggles, gloves and masks, and prepare necessary protective equipment such as protective plates during the experiment (實驗前做好充分的準備工作, 實驗時穿戴好防護服, 防護眼鏡、手套面罩, 準備好防護板等必要的防護用具)

Operating principles

- Before starting the experiment, check the relevant experimental facilities, such as the connection of the reactor, the power plug-in, ventilation, and the reagents. Familiar with hair dryer, electromagnetic stirrer and heating system, rotary evaporator, oven, oil pump, etc. (正式開始實驗前必須檢查所有相關實驗設施的完好，如反應器皿連接正確，電源外掛程式安全，通風良好，反應原料和試劑正確無誤等。電吹風，電磁攪拌器與加熱系統，旋轉蒸發儀，烘箱，油泵等要熟悉)
- You have to fully understand in advance what experiment you are going to do (任何反應循序漸進，對你要進行的反應事先要做到心中有數)

- When accidents happen, stay calm.
- You have responsibilities for your own and others safety.
- Report to your supervisor, lab technician, safety committee in a timely manner
- Deal with accidents properly



Keep safety in your mind, conduct experiments properly and carefully! Stay safe, stay healthy and stay well!
安全在您心中，生命和健康在您手和意識中！



Any problem?

A photograph of a forest path. The path is made of dirt and grass, leading into the distance. Tall trees with green leaves line both sides of the path, creating a canopy. Sunlight filters through the leaves, creating dappled light on the path. The overall color palette is dominated by greens and browns, with a warm, golden light from the sun.

**Wish you have a safe
and fruitful journey in
ICMS!**