

Departments of Chemistry and Materials Science & Engineering, University of Arizona

Using Hydrofluoric Acid Safely

Hydrofluoric acid (HF) is extremely hazardous and potentially lethal when used inappropriately. Widely used in the microelectronics industry to etch silicon, HF can be obtained in its native gas state and as solution in water. Another similarly poisonous fluoride formulation is called Buffered Oxide Etch (BOE). BOE is a buffered solution of ammonium fluoride and hydrofluoric acid that, while less corrosive than HF, is just as poisonous. When used properly with personal protective equipment, HF and BOE can be remarkably useful for a variety of applications ranging from catalysis to etching glass.



"Minor" HF Burn

While its corrosive characteristics alone should be reason for caution in working with HF, the greatest danger is the fluoride ions that reacts with and ties up the calcium in bone and in organs. Exposed tissue develops a painful, slowly healing burn. This coupled with the ease with which fluoride penetrates the skin, make wearing gloves, goggles and an apron a must with HF or BOE.

Case Study: In 1997, a geochemist in Australia spilled between 100-230 milliliters of 50% HF on his leg. He immediately flushed the area with water, but did not remove the contaminated clothes. He did not have calcium gluconate cream in his lab. With increasing pain from the burn, he jumped into a swimming pool where he stayed until the medical rescue team arrive 30-40 minutes after his exposure. They injected calcium gluconate and took the patient to a hospital where he was placed on intravenous calcium drip. After 7 days, they had to amputate his leg. Fifteen days after the accident, he died from multiple organ failure.

Proper Procedures

- Always make sure you have calcium gluconate cream in lab *before* working with HF or BOE.
- **Wear gloves, goggles and an apron.**
- Use HF or BOE only if absolutely necessary and use as little as possible.
- Do not work alone with HF or BOE.
- If contaminated with aqueous HF or BOE:
 - 1) Use lab shower to thoroughly wash
 - 2) Strip clothes while in shower.
 - 3) Have someone call 911
 - 4) Liberally apply calcium gluconate cream to and around contaminated area.