



Diisopropyl fluorophosphate

(DFP, diisopropyl phosphorofluoridate,
Dyflos, isopropyl fluophosphate)

Chemical and Physical Characteristics

F.W.	184.15	
m.p.	-82°C	
b.p.	62°C/9mm	
n_D^{20}	1.3850	
d	1.055	
Vapor pressure (20°C)	0.579mm	
Solubility	H ₂ O (25°C) 1.54% w/w (dec.; pH~2.5). Soluble in vegetable oils; not very soluble in mineral oils.	

DFP is a practically odorless, mobile liquid, which is readily hydrolyzed by alkali. Slow hydrolysis in water yields HF.

Application

DFP is a **potent inactivator of cholinesterase**, and is widely used in enzyme studies for inactivation of proteases and esterases.

Toxicity

DFP is a **powerful inhibitor of cholinesterase**, and possesses powerful myotic action (constriction of the pupils of the eyes). DFP is highly toxic by all routes of administration. Following are some toxicity data:

oral-rat	LD ₅₀ 6mg/kg
skin-mus	LD ₅₀ 72mg/kg
ihl-rat	LD ₅₀ 360mg/m ³ /10min.
ivn-mus	LD ₅₀ 3200µg/kg
ipr-rat	LD ₅₀ 1280µg/kg
ims-rat	LD ₅₀ 1800µg/kg
scu-dog	LD ₅₀ 3mg/kg

The compound is very volatile, and resembles hydrocyanic acid and Parathion in toxicity. Signs and symptoms of exposure include:

Mild - headache, anorexia, nausea, weakness, dizziness, blurred vision and myosis.

Moderate - vomiting, abdominal cramps, diarrhea, salivation, lachrymation, sweating, dyspnea, substernal tightness, slow pulse, tremors of extremities, muscular cramps and ataxia.

Severe - fever, cyanosis, pulmonary edema, areflexia, loss of sphincter control, convulsions, coma, heart block, shock and respiratory failure

Handling

1. DFP SHOULD BE HANDLED ONLY BY PERSONS FAMILIAR WITH ITS PROPERTIES! USE ADEQUATE VENTILATION! AVOID CONTACT AND INHALATION! All work with DFP should be carried out in a well ventilated hood. Chemical goggles, self-contained breathing apparatus, long-sleeved coveralls with tight-fitting cuffs and collar, impervious sleeves, gloves and boots should be used. (If a canister gas mask is

used, the canister should be destroyed after use).

(It is prudent that a similarly attired assistant be in attendance in case of emergency. Speed in removing material from skin is of extreme importance. Remove and isolate contaminated clothing and shoes at the site).

- A doctor should be alerted of the plan to work with DFP so that the antidotes atropine sulfate and 2-PAM (2-pyridinealdoxime methiodide) are made available and ready if their use is required.
- Two baths of 2% aqueous NaOH should be kept in readiness in the hood. In case of breakage, the container and other contaminated equipment should be immersed into the solutions and allowed to stand several days.

First Aid

Call a Physician

Eyes should be irrigated thoroughly. Contaminated areas of the body should be washed with soap and water. Artificial respiration or oxygen administration should be initiated. Call a physician immediately so that an antidote may be administered.

Spill and Disposal

In case of a spill, clear the area immediately. Wear self-contained breathing apparatus and full protective clothing. Absorb material on vermiculite, sweep or scoop up, mix with dry caustics, wrap in paper and burn in an incinerator.

For disposal, add to a large excess of 2% NaOH solution in a chemical fume hood. Let stand at least 48 hours to ensure complete hydrolysis (pH should be >9). Neutralize and flush solution with copious amounts of water into an appropriate disposal system. Please note that disposal must be in accordance with Federal, State and local regulations.

Storage

DFP may develop pressure, therefore it should be stored in a refrigerator. Care should be exercised in handling. Discolored material should not be used.

References

- "The Merck Index"; 9th ed.; Merck and Co. and Co.; Rahway, New Jersey, 1976, p 678
- No. TE5075000, "Registry of Toxic Effects of Chemical Substances"; U.S. Government Printing Office; Washington, D.C.
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- Gould, R.G.; Liener, I.E. *Biochemistry* **1965**, 4, 90.
- Bouma, B.N.; Miles, L.A.; Beretta, G.; Griffin, J.H. *ibid.* **1980**, 19, 1151.

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