

Hazardous Chemicals in Illicit Methamphetamine and Amphetamine Laboratories

Many of the hazards associated with Clandestine laboratories originate from the ingredients used and the by-products produced. For persons making drugs, and family and children present during manufacture, the most dangerous chemicals include solvents, due to their volatility and risk of fire and explosion, corrosive agents including acids and sodium hydroxide, and reaction byproducts such as phosphine gas. For manufacture of methamphetamine using the Nazi process, ammonia and water-reactive metals such as sodium and lithium are extreme hazards. Lead and mercury were formerly important contaminants with older "meth" manufacture but are less prevalent in current labs. Release of these products and toxic mixtures can harm the "cooks," their families and friends, first responders (law enforcement personnel, paramedics, emergency medical technicians, fire fighters, social workers, and hospital employees), those responsible for cleanup, and individuals reoccupying improperly decontaminated areas. Chemicals with low volatility would be expected to pose the greatest exposure hazard from residual contamination. Due to their continuing brain development and special behaviors (such as crawling on the floor and placing objects in their mouths) children may be at a greater health risk from exposure to chemicals in methamphetamine laboratories.

For the following list, vapor pressure is given at 20°C (68°F) unless otherwise specified and all odor thresholds are from the AIHA unless otherwise indicated.

PEL = Occupational Safety and Health Administration (OSHA) Permissible Exposure Level;
TLV = American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value;

TWA = Time Weighted Average;

STEL = Short-Term (15 minute) Exposure Limit;

C = Ceiling Limit (level not to be exceeded);

IDLH = National Institute for Occupational Safety and Health (NIOSH) Immediately Dangerous to Life and Health concentration.

Acetic Acid (Glacial) (CAS 64-19-7)

Form: Colorless liquid, solid below 62°F, sour, vinegar odor

Use: Reagent used in the manufacture of phenyl-2-propanone (P2P) for methamphetamine and amphetamine

Physical properties: Boiling point 118°C (244°F), vapor density 2.1, vapor pressure 11 mmHg

Exposure limits: TLV-TWA 10 ppm, STEL 15 ppm, IDLH 50 ppm

Hazards: Corrosive and strong irritant. Vapors cause eye irritation. Exposure to high concentration may cause inflammation of the airway, accumulation of fluid in the lungs, severe burns, blurred vision, ulcers of the eyes and permanent eye damage. Chronic exposure may cause irritation of the nose, throat, and airway, irritation of the eyes, and reproductive problems.

Flammable when moderately heated.

Potential Risks: Acetic acid, which is used in the manufacture of both amphetamine and methamphetamine, is a health risk to all exposed individuals, especially children. Hazards result from skin or eye contact with this acid, inhalation of vapors, or fire due to its flammability.

Acetic anhydride (CAS 108-24-7)

Form: Liquid, colorless, strong vinegar-like odor

Use: Reagent in P2P synthesis

Physical properties: Boiling point 139°C (282°F), vapor pressure 4 mmHg, vapor density 3.5, odor threshold 0.4 ppm

Exposure limits: PEL 5 ppm, IDLH 200 ppm

Hazards: Corrosive and irritant. Vapors are irritating to eyes, mucous membranes and skin. Exposure to high concentration can lead to ulcerations of the nasal mucosa and in some cases bronchospasm. The liquid and vapor can severely damage the eye. This is characterized by immediate burning followed by corneal and conjunctival edema several hours later and in severe cases corneal opacification with loss of vision. Skin contact may cause skin to redden and subsequently turn white and wrinkled, with moderate pain. The appearance of skin burns may be delayed.

Potential Risks: This reagent used in the synthesis of P2P is a corrosive, causing skin burns. Its vapors can lead to eye damage, making it a health risk to individuals exposed during the manufacturing process and cleanup.

Acetone (CAS 67-64-1)

Form: Colorless liquid, sweet fragrant odor

Use: Solvent used in methamphetamine production

Physical properties: Boiling point 56°C (133°F), vapor pressure 180 mmHg, vapor density not given

Exposure limits: TLV-TWA 500 ppm, IDLH 2500 ppm

Hazards: Irritating to the eyes and skin. Vapors may be irritating, causing irritation of the throat, airways, and lung. Prolonged exposure to high concentrations may lead to coughing, blurred vision, fatigue, tremors, convulsions, stupor, bizarre behavior, coma, and death. Alcohol and other chemicals may increase toxic effects. Flammable or explosive when mixed with air at room temperature. May explode when exposed to heat or fire.

Potential Risks: This solvent, which is used in the production of methamphetamine is dangerous primarily because of its flammability and its potential to explode when exposed to heat. At high concentrations it is toxic and potentially lethal. It is a health risk to all individuals exposed during the manufacturing process and those responding to a laboratory fire.

Ammonia (CAS 7664-41-7)

Form: Gas (liquid under pressure), colorless, pungent odor

Use: Reagent in methamphetamine synthesis, Nazi method. Used as liquid for reaction since sodium metal is water reactive.

Physical properties: Boiling point -33.4°C (-28.1°F), vapor density 0.6

Exposure limits: TLV-TWA 25 ppm, STEL 35 ppm, IDLH 300 ppm

Hazards: Corrosive and irritant. Reacts with moisture in the mucosal surfaces (eyes, skin and respiratory tract) to produce ammonium hydroxide. Exposure to vapors at high concentrations can result in burns to eyes, nose, pharynx, and larynx. Eye exposure may result in conjunctivitis, lacrimation, corneal irritation, and temporary or permanent blindness. Respiratory exposure may result in bronchospasm, laryngitis, tracheitis, wheezing, dyspnea, and chest pain. Exposure may also result in pulmonary edema and chemical pneumonitis. Skin exposure to concentrated vapors or liquid can lead to deep penetrating burns.

Potential Risks: Ammonia is a gas used in methamphetamine synthesis. Its vapors are a health risk to all individuals in the vicinity during the manufacturing process.

Benzaldehyde (CAS 100-52-7)

Form: Liquid, colorless, bitter almond odor

Use: Precursor for amphetamine or P2P synthesis, with nitroethane

Physical properties: Boiling point 176°C (354°F), vapor pressure 1 mmHg at 26.2°C (79.2°F), vapor density 3.7, odor threshold 0.04 ppm

Exposure limits: None

Hazards: Mild irritant to the lungs, a narcotic at moderate doses, and a convulsant at higher doses. It may cause contact dermatitis. It may cause skin sensitization and allergic contact dermatitis. Vapors are irritating to eyes. May be absorbed through the skin.

Potential Risks: This liquid is a health risk, especially in high concentrations. It is a precursor in the production of amphetamines, making it a hazard to those exposed during the manufacturing process.

Benzyl chloride (CAS 100-44-7)

Form: Liquid, colorless to slightly yellow, pungent aromatic odor

Use: Used in methamphetamine production

Physical properties: Boiling point 179°C (355°F), vapor density 4.4, vapor pressure 1 mmHg, odor threshold 0.04 ppm

Exposure limits: PEL 1 ppm, IDLH 10 ppm

Hazards: Severe irritant to the eyes, mucous membranes and skin. It will produce lacrimation at low concentrations and also weakness, irritability, and persistent headache. At sufficient concentration inhalation may produce pulmonary edema. Liquid in the eye can produce severe irritation and corneal injury. Skin contact may produce dermatitis and skin sensitization.

Potential Risks: This liquid, which is used in methamphetamine production, is a severe irritant to the eyes and can have other harmful effects to individuals present during the manufacturing process.

Benzene (CAS 71-43-2)

Form: Colorless to light-yellow liquid, aromatic odor

Use: Solvent used in methamphetamine production

Physical properties: Boiling point 80°C (176°F), vapor pressure 74.6 mmHg, vapor density not determined

Exposure limits: TLV-TWA 1 ppm, STEL 5 ppm, IDLH 500 ppm

Hazards: Vapor in high concentration may affect the nervous system causing headache, dizziness, breathing difficulties, coughing, fluid in the lungs, coma, lung, liver, or kidney damage, or death. Prolonged inhalation may lead to anemia or leukemia. Chronic exposure can irritate the eyes, nose, throat and lungs and may affect the central nervous system, bone marrow, and respiratory tract. Symptoms include allergies, confusion, headache, short term memory loss, coma, or death. Benzene is extremely flammable and vapor may cause a flash fire.

Potential Risks: Benzene is used in methamphetamine production. It is extremely flammable and inhalation of the vapors is very hazardous to exposed individuals present during the manufacture, cleanup, and response to fire. Chronic exposure, especially in young children can cause severe health problems.

Coleman Fuel(Light Hydrotreated Distillate) (CAS 68410-97-9)

Form: Liquid

Use: Solvent used to extract d-methamphetamine

Physical properties: Boiling point 38°C (100°F), vapor pressure 518 mmHg, vapor density 3

Exposure limits: TWA 400 ppm

Hazards: Vapor may cause delayed lung injury, nervous system depression, convulsions, and loss of consciousness. Irritant to skin and eyes. Can form flammable mixture with air at room temperature.

Potential Risks: Coleman fuel is a solvent used in the extraction of d-methamphetamine. It is hazardous due to its flammability when mixed with air. Vapors are a health hazard to individuals during the manufacturing phase.

Ephedrine (CAS 299-42-3)

Form: White crystal, odorless

Use: Precursor in manufacture of methamphetamines

Physical properties: Not available

Exposure limits: None

Hazards: Irritant to eyes, skin, and respiratory system. Ingestion may lead to headache, rapid pulse, high blood pressure and stroke.

Potential Risks: Ephedrine is a precursor used in the manufacture of methamphetamines. In addition to being an irritant, ingestion of excessive amounts can have serious effects.

Ethanol(CAS 64-17-5)

Form: Clear, colorless liquid

Use: Used in the production of methamphetamine

Physical properties: Boiling point 79°C (173°F), vapor pressure 5.8 mmHg, vapor density 1.6

Exposure limits: TLV-TWA 1000 ppm, IDLH 3300 ppm

Hazards: Inhalation may irritate the nose and throat, causing headache, nausea, vomiting, drowsiness, or confusion. Ingestion can lead to burning sensation, confusion, dizziness, seizures, blurred vision, blindness, unconsciousness, or death. Chronic exposure may lead to headache, lack of coordination, fatigue, damage to nervous system, liver, stomach, and heart. Vapor and liquid are extremely flammable.

Potential Risks: Ethanol and its vapors are extremely flammable, making it a health risk to all present. Ingestion is common and in large amounts can lead to severe health effects in children.

Ethyl Ether(CAS 60-29-7)

Form: Colorless liquid, sweet pungent odor

Use: Solvent used in the manufacture of methamphetamine and amphetamine

Physical properties: Boiling point 35°C (94°F), vapor pressure 58.6 mmHg, vapor density 2.6

Exposure limits: TLV-TWA 400 ppm, STEL 500 ppm, IDLH 1900 ppm

Hazards: Inhalation or ingestion causes headache, drunkenness, and vomiting.

Flammable and highly volatile. In the presence of oxygen or sunlight, unstable peroxides may form, which explode spontaneously or when heated.

Potential Risks: This solvent is used in the manufacture of both amphetamine and methamphetamine. Inhalation can lead to toxic nervous system effects. It is highly volatile and flammable making it a risk to all those in the vicinity and to individuals responding to a fire.

Formic Acid (CAS 64-18-6)

Form: Colorless liquid, pungent odor

Use: Used in the manufacturing process

Physical properties: Boiling point 101°C (224°F), vapor pressure 4.6 mmHg, vapor density 1.6

Exposure limits: TLV-TWA 5 ppm, STEL 10 ppm, IDLH 30 ppm

Hazards: Corrosive to eyes, skin, lungs and gastrointestinal tract. It is readily absorbed into the skin, causing piercing pain, reddening, burns, and severe toxic effects. Vapor may cause severe irritation of the eyes, nose and throat. Severe inhalation leads to accumulation of fluid in the lungs, shock and death. Ingestion can produce severe burns, bloody diarrhea, and agonizing pain. Non-flammable, but may explode violently on contact with oxidizing agents.

Potential Risks: This acid is corrosive to the skin and also can cause severe toxic effects from absorption into the skin. Inhalation may cause accumulation of fluid in the lungs and even death. It can explode violently when in contact with oxidizing reagents. It is a hazard to all individuals present during manufacturing and cleanup.

Hexane (other isomers)

Form: Colorless liquid, mild characteristic odor

Use: Solvent used in production of methamphetamine

Physical properties: Boiling point 69°C (156°F), vapor pressure 16 mmHg, vapor density 3.0

Exposure limits: TLV-TWA 500 ppm, STEL 1000, IDLH 1100 ppm

Hazards: Prolonged exposure can lead to permanent brain and nerve damage with coughing, bizarre behavior, unconsciousness, coma, or death. Extremely flammable.

Potential Risks: Hexane is an extremely flammable solvent used in the production of methamphetamine, making it a risk to all individuals in the area or responding to fire. Its health effects from chronic exposure make it harmful to laboratory residents, especially children.

Hydrochloric Acid (Muriatic acid) (CAS 7647-01-0)

Form: Colorless liquid, pungent odor (Muriatic acid refers to an industrial grade of hydrochloric acid)

Use: Reagent used in the manufacture of methamphetamine

Physical properties: Boiling point 53°C (127°F), vapor pressure 190 mmHg, vapor density no information found

Exposure limits: PEL-C 5 ppm, IDLH 50 ppm (as hydrogen chloride gas)

Hazards: Very corrosive. Causes severe pain and burns on the skin. Inhalation may destroy the lining in the airways, throat, and lungs. Can lead to permanent lung damage. Prolonged exposure may cause tooth decay and skin allergies. Heating can lead to release of toxic, flammable and explosive gas.

Potential Risks: This acid is a reagent used in the production of methamphetamine. It is very corrosive, causing severe burns on contact and lung damage if inhaled. Gases released during heating are toxic and also flammable and explosive, making it a hazard to inhabitants of the laboratory, those involved in cleanup, and first responders.

Hydrogen Chloride (CAS 7647-01)

Form: Colorless gas

Use: Used in the manufacture of methamphetamine

Physical properties: Boiling point -85°C (-121°F), vapor density 1.3

Exposure limits: TLV-C 5 ppm, IDLH 50 ppm

Hazards: High concentrations are very corrosive and may cause severe burns. Inhalation may cause mild to severe irritation of the nose and throat with possible fluid in the lungs.

Potential Risks: This gas used in the manufacture of methamphetamine in very corrosive, causing severe burns. It is a health hazard to individuals present in the laboratory and those involved in cleanup.

Hydrogen iodide (gas), Hydriodic acid (liquid)(CAS 10034-85-2)

Form: Gas (soluble in water), colorless

Use: Reagent in methamphetamine synthesis, with red phosphorous

Physical properties: Boiling point -35.1°C (-31.2°F), vapor density 4.4, odor threshold not available

Exposure limits: None

Hazards: Corrosive and irritant. Exposure can occur to both liquid and gas. Inhalation causes irritation of the throat and upper respiratory tract, and at higher concentrations dyspnea, chest pain, bronchospasm, and pneumonitis. Severe exposures result in pulmonary and laryngeal edema. Will cause severe irritation to the eyes. Skin contact at high concentrations may lead to burns.

Potential Risks: This substance may be in gas or liquid form and is used in the red phosphorous method of methamphetamine synthesis. It is corrosive and an irritant. It is a health risk to both inhabitants of the laboratory and first responders.

Hypophosphorous Acid (CAS 6303-21-5)

Form: Colorless liquid

Use: Used instead of red phosphorus as reagent in methamphetamine

Physical properties: Boiling point not found, vapor pressure less than 17 mmHg

Exposure limits: None

Hazards: Corrosive. Causes burns if inhaled or on contact with skin. Extremely destructive to mucous membranes.

Potential Risks: This acid is corrosive, causing burns to those inhaling its vapors and those in direct contact with it.

Iodine (CAS 7553-56-2)

Form: Solid, purple crystals or flakes, sharp odor

Use: Reagent in synthesis of hydriodic acid

Physical properties: Melting point 113°C (236°F), boiling point 184°C (364°F), vapor pressure 0.3 mmHg at 25°C (77°F), vapor density 4.93, odor threshold 0.85 ppm (9.0 mg/m³), irritating concentration 2.0 mg/m³ (0.19 ppm)

Exposure limits: TLV-C 0.1 ppm, IDLH 2 ppm

Hazards: Corrosive. Ingestion of iodine will cause vomiting, delirium, headache, low blood pressure, and circulatory collapse. Inhalation of iodine vapors is very irritating to the mucous membranes and at high concentrations may lead to pulmonary edema. Skin contact may cause redness and swelling.

Potential Risks: Iodine is used in the manufacture of hydriodic acid for methamphetamine synthesis. It is corrosive and can cause serious health problems if ingested or inhaled in high concentrations. It can be a risk for those present in the laboratory and individuals involved in cleanup.

Iodine, Prill(CAS 7553-56-2) See Iodine

Form: Round beads of iodine

Iodine, tincture

Form: Dark red solution with a medicinal odor

Use: Reagent in synthesis of hydriodic acid

Physical properties: Boiling point 82°C (180°F), vapor pressure 10 mmHg, vapor density >1

Exposure limits: TLV-C 0.1 ppm, IDLH 2 ppm

Hazards: Harmful if inhaled or swallowed. May cause intoxication and severe irritation. Flammable.

Potential Risks: This reagent, used in hydriodic acid synthesis, is flammable, making it a hazard to all present individuals and those responding to fire. It is harmful if inhaled and can cause intoxication if swallowed.

Lead acetate (CAS 301-04-2)

Form: Solid, white crystals or for commercial grades brown or grey lumps, odorless

Use: Reagent in P2P synthesis

Physical properties: Melting point 280°C (536°F)

Exposure limits (for lead): TLV-TWA 0.05 mg/m³, IDLH 100mg/m³

Hazards: Mostly a chronic exposure hazard by ingestion or inhalation of dust. Will form fumes at high temperatures. Poisoning symptoms include abdominal cramping, nausea, anorexia, vomiting, constipation, diarrhea, and difficulty concentrating. Children are more susceptible to exposure due to increased absorption and greater effects on the developing nervous system.

Potential Risks: This crystalline material is used in P2P synthesis. Health hazard is mainly from chronic exposure, especially in children.

Lithium aluminum hydride (CAS 1302-30-3)

Form: Solid, white to grey powder, odorless

Use: Used for hydrogenation in multiple processes

Physical properties: Decomposes at 125°C (257°F) to form lithium hydride, aluminum metal, and hydrogen

Exposure limits: None

Hazards: Corrosive. Extremely water reactive, will generate hydrogen gas and explode. It is severely irritating to the eyes, nose, skin, mucous membranes, and lungs. Eye exposure can result in scarring and inflammation.

Potential Risks: This solid is used in the hydrogenation process during methamphetamine production. It is corrosive and reacts with water to form explosive hydrogen gas, making it a risk to inhabitants and first responders.

Mercuric chloride (CAS 7487-94-7)

Form: Solid, white crystals, odorless

Use: Reagent in methamphetamine synthesis, P2P method

Physical properties: Melting point 276°C (529°F), boiling point 302°C (576°F)

Exposure limits (for mercury compounds): TLV-TWA 0.025 mg/m³, IDLH 10 mg/m³

Hazards: Corrosive. Ingestion results in intense epigastric and abdominal pain and emesis which may be bloody, and later renal failure. Inhalation of dust can cause respiratory irritation, major destruction of lungs and airways, kidney failure, shock, and bizarre behavior. Eye exposure can lead to corrosive injury. Chronic exposure may lead to build up in the brain, liver, and kidneys. Releases toxic fumes when heated.

Potential Risks: This solid reagent used to manufacture methamphetamine and P2P is a corrosive chemical. Inhalation as well as ingestion, can cause severe health hazards.

Long-term exposure may lead to brain, liver, and kidney damage, making this chemical hazardous to those living in the laboratory and those involved in cleanup. Toxic fumes released upon heating make it a potential hazard to first responders as well.

Methyl Alcohol(HEET) (CAS 67-56-1)

Form: Clear colorless liquid, characteristic odor

Use: Used in the production of methamphetamine

Physical properties: Boiling point 64.5°C (147°F), vapor pressure 97 mmHg, vapor density 1.1

Exposure limits: TLV-TWA 200 ppm, STEL 250 ppm, IDLH 6000 ppm

Hazards: Vapors may cause irritation of the eyes, nose, throat, and lungs. Ingestion may lead to headache, nausea, abdominal pain, loss of consciousness, coma, blindness, and brain, pancreas, or kidney damage. Flammable.

Potential Risks: Methyl alcohol is used in the synthesis of methamphetamine. Its vapors are irritants and acute ingestion can lead to blindness and other organ damage, making it a danger to inhabitants of the laboratory, especially children. It is flammable and therefore a risk to first responders.

Methylamine (CAS 74-89-5)

Form: Gas or liquid, colorless, strong fish/ammonia odor (Usually encountered as a 40% weight/volume in water)

Use: Precursor for methamphetamine

Physical properties: Boiling Point -6.3°C (20.6°F), vapor density 1.07, odor threshold 4.7 ppm

Exposure limits: TLV-TWA 10 ppm, STEL 15 ppm, IDLH 100 ppm

Hazards: Severe irritant to the eyes, mucous membranes and skin. It has been reported to be linked with the generation of allergic or chemical bronchitis. Exposure to this compound can lead to olfactory fatigue. Exposure to the eye can cause conjunctival hemorrhage, and superficial corneal opacities and edema. On the skin a 40% solution caused tissue destruction.

Potential Risks: This chemical, found as either a gas or liquid, is a precursor in methamphetamine production. It is a severe irritant and can cause chemical bronchitis. It is a hazard to individuals in the laboratory during the manufacturing process and those involved in cleanup.

Muriatic Acid(see Hydrochloric Acid)

Naphtha(CAS 8002-05-9)

Form: Reddish-brown liquid, aromatic odor

Use: A petroleum distillate solvent used in the manufacture of methamphetamine

Physical properties: Boiling point 104°C (220°F), vapor pressure 22 mmHg, vapor density 3.4

Exposure limits: PEL 500 ppm, IDLH 1100 ppm

Hazards: May cause irritation or burns to skin and eyes. Inhalation may lead to central nervous system depression, headache, nausea, dizziness, confusion, and unconsciousness.

Potential Risks: Naphtha is an aliphatic petroleum solvent used in the manufacture of methamphetamine. Inhalation can have serious effects, making it a health hazard to individuals present during the manufacturing process.

Nitroethane (CAS 79-24-3)

Form: Liquid, oily colorless, mild fruity smell.

Use: Precursor for P2P synthesis

Physical properties: Boiling point 114°C (237°F), vapor pressure 21 mmHg at 25°C (77°F), vapor density 2.58, odor threshold 163 ppm

Exposure limits: PEL 100 ppm, IDLH 1000 ppm

Hazards: Skin, eye and mucous membrane irritant. It may cause anorexia, nausea, vomiting and diarrhea. In animals it has resulted in renal and liver toxicity, and is a central nervous system depressant. It produces weakness, ataxia and convulsions. Its vapors cause irritation to the respiratory tract, coughing, or difficulty in breathing. Skin exposure may produce erythema and swelling with pain. Eye exposure may cause irritation.

Potential Risks: Nitroethane is used as a precursor for P2P synthesis. It is an irritant and may be harmful to those present during the manufacturing process.

Phenylacetic acid (CAS 103-82-2)

Form: Solid, white shiny crystals, floral odor.

Use: Precursor for the synthesis of P2P

Physical properties: Melting point 76.5°C (170°F), boiling point 265°C (510°F), vapor pressure 0.004 mmHg, vapor density 1.09, odor threshold not available

Exposure limits: None

Hazards: Irritant. Oral toxicity of this compound is low. It is slightly irritating to the skin. It is a possible teratogen. Eye exposure may result in mild irritation. Inhalation of the compound may lead to headache, nausea, and dizziness.

Potential Risks: This precursor of P2P is an irritant and a possible teratogen. It is most hazardous to those present during the synthesis of P2P.

Phenyl-2-propanone (P2P) (CAS 103-79-7)

Form: Liquid

Use: Precursor for methamphetamine

Physical properties: Boiling point 215°C (419°F), vapor density 1.003

Exposure limits: None

Hazards: Oral toxicity of this compound is low. It is slightly irritating to the skin. Eye exposure would result in mild irritation. Inhalation of the compound may lead to headache, nausea, dizziness. These symptoms may be due to the organic nature of the compound or to the odor.

Potential Risks: This precursor of methamphetamine is an irritant to the skin. Inhalation may cause symptoms. It is a health risk to those inhabiting the laboratory.

Phosphine (CAS 7803-51-2)

Form: Colorless gas, fish- or garlic-like odor

Use: Product of methamphetamine production

Physical properties: Boiling point -87.7°C (-125.9°F), vapor pressure 31500 mmHg, vapor density 1.18 Exposure limits: TLV-TWA 0.3 ppm, STEL 1.0 ppm, IDLH 50 ppm

Hazards: Extremely flammable, reacts explosively with air. Inhalation may cause dizziness, dullness, tremors, vomiting, shortness of breath, delayed lung damage and convulsions.

Potential Risks: Because of its explosive reaction with air, phosphine gas is a hazard to those present in the laboratory during the manufacturing process and first responders. It has been linked to several deaths in clandestine laboratories.

Phosphoric Acid (CAS 7664-38-2)

Form: Hygroscopic, colorless crystals

Use: Precursor in production of methamphetamine and amphetamine

Physical properties: Boiling point 213°C (415°F), vapor pressure 4 mmHg, vapor density 3.4

Exposure limits: TVL-TWA 1 mg/m³, STEL 3 mg/m³, IDLH 1000 mg/m³

Hazards: Eye irritant causing irritation, tearing, blinking, and burns. Vapor can irritate nose and throat. Exposure to skin results in irritation, redness, itching, swelling, and burns. Chronic exposure may cause allergies, damage to lungs, liver, bloodstream, and bone marrow. Contact with metal can cause release of poisonous and explosive phosphine gas.

Potential Risks: A precursor used in methamphetamine and amphetamine, this acid is an irritant to eyes, nose, and throat. Long-term exposure may be damaging to lungs, liver, and bone marrow, making it harmful for individuals living in the laboratory, especially children.

Pseudoephedrine (CAS 321-97-1)

Form: White crystalline powder

Use: Precursor used in the production of methamphetamines

Physical properties: Not available

Exposure limits: None

Hazards: Irritant to eyes, skin, and respiratory system. Ingestion may lead to headache, rapid pulse, high blood pressure and stroke.

Potential Risks: Ephedrine is a precursor used in the manufacture of methamphetamines. In addition to being an irritant, ingestion of excessive amounts can have serious effects.

Pyridine (CAS 110-86-1)

Form: Liquid, colorless to yellow, nauseating fish-like odor

Use: Reagent in the synthesis of P2P from phenylacetic acid in the presence of acetic anhydride.

Physical properties: Boiling point 115°C (240°F), vapor pressure 16 mmHg, vapor density 2.73, odor threshold 0.74 ppm

Exposure limits: PEL 5 ppm, IDLH 1000 ppm

Hazards: Irritant and centralnervous system depressant. On ingestion it may cause liver and kidney damage. Exposure to vapor may cause headache, vertigo, nervousness, sleeplessness, nausea, and vomiting. Lower back pain may develop with no evidence of kidney damage. Skin irritation may result from prolonged or repeated contact.

Potential Risks: This reagent used to produce P2P can cause central nervous system depression. Vapor can cause symptoms in individuals present during the manufacturing process.

Red phosphorus (CAS 7723-14-0)

Form: Solid, red to violet, odorless

Use: Catalyst in methamphetamine synthesis

Physical properties: Burns when heated in air to 260°C (500°F) with formation of pentoxide fumes.

Exposure limits: None

Hazards: Red phosphorus is considered relatively non-toxic. If heated it can either produce toxic fumes or convert to yellow phosphorus which will burn on contact with air, and cause severe burns. If heated in the presence of acid, it can form phosphine gas.

Potential Risks: This catalyst in methamphetamine production is mainly a serious hazard due to its ability to form phosphine gas in the presence of acid. It is also explosive, making it a possible hazard to individual involved in cleaning laboratories and dump sites in addition to those present in the laboratory during the manufacturing process.

Ronsonol(Lighter Fluid)

Form: Reddish brown liquid, aromatic odor

Use: A petroleum distillate solvent consisting of twosolvent naphtha fractions, light aliphatic 95% (CAS 64742-89-8) and medium 5% (CAS 64742-88-7); and Shell Sol RB 100%.

Physical Properties: Similar to naphtha.

Exposure Limits: See "Naphtha" Potential Risks: See "Naphtha"

Sodium(CAS 7440-23-5)

Form: Solid, silvery-white metal or crystals, odorless

Use: Used for hydrogenation in methamphetamine synthesis

Physical properties: Melting point 97.8°C (208°F), boiling point 883°C (1621°F)

Exposure limits: None available

Hazards: Corrosive. Extremely water reactive, producing hydrogen gas and sodium hydroxide. Metallic sodium can react with water on skin to cause thermal and chemical burns. It is severely irritating to the eyes, nose, skin, mucous membranes, and lungs. Eye exposure can result in scarring and inflammation.

Potential Risks: Sodium metal is corrosive and extremely water reactive, producing explosive hydrogen gas. It reacts with water on the skin to cause burns. It is a health risk to individual present during manufacturing and first responders.

Sodium Hydroxide (Lye) (CAS 1310-73-2)

Form: White pellets or flakes, odorless

Use: Reagent used in methamphetamine manufacture

Physical properties: Boiling point 1390°C (2534°F), vapor pressure negligible, vapor density 1.0

Exposure limits: TLV-C 2 mg/m³, IDLH 10 mg/m³

Hazards: Very corrosive. Contact of the eyes with vapor or powder can cause severe eye burns with permanent damage. Contact with skin causes severe irritation and burns.

Inhalation of vapors and dust can lead to burns of the lungs and air passages. Carcinogen if ingested. Contact with metals or fire may produce deadly and explosive hydrogen gas.

Potential Risks: This reagent, used in the manufacture of methamphetamine, is very corrosive. It can cause severe burns of the eyes, skin, and the lungs. In the presence of metals or fire, explosive gas may result, making it a hazard to those present in the laboratory and first responders.

Sulfuric Acid (CAS 7664-93-9)

Form: Colorless to yellow viscous liquid, odorless

Use: Reagent used in manufacture of amphetamine, methamphetamine, and P2P

Physical properties: Boiling point 290°C (554°F), vapor pressure 7 mmHg

Exposure limits: TLV-TWA 1 mg/m³, STEL 3 mg/m³, IDLH 15 mg/m³

Hazards: Contact with eyes causes severe burns, pain, tearing swelling, permanent damage, or blindness. Corrosive to the skin, causing severe deep burns, blistering, swelling, and scarring. Harmful or fatal if inhaled, causing possible lung damage, cough, difficulty breathing, and subsequent respiratory failure. Chronic exposure may lead to lung damage, skin allergies, kidney and liver damage. Reacts violently with water to produce toxic and corrosive fumes. Carcinogen.

Potential Risks: This reagent is used in the manufacture of amphetamine and methamphetamine. It may cause severe burns on contact and may be harmful or fatal if inhaled. Chronic exposure may lead to damage of liver, lungs and kidneys. It reacts violently with water to produce corrosive fumes. It presents health risks to those present during manufacturing,

Thionyl chloride (CAS 7719-09-7)

Form: Liquid, colorless, pale yellow, or reddish, with a suffocating pungent odor

Use: Reagent in methamphetamine synthesis

Physical properties: Boiling point 76°C (169°F), decomposes at 140°C (284°F) to form Cl₂, SO₂, and S₂Cl₂, vapor pressure 100 mmHg at 21°C (70°F), vapor density 4.1, odor threshold not available

Exposure limits: TLV-C 1 ppm, IDLH not determined

Hazards: Strongly irritating or caustic to the eyes, lungs, skin, and mucous membranes. Severe acute exposure may result in pulmonary edema, pneumonia, and death. Skin exposure may cause irritation, burning and dermatitis. Eye exposure may produce burns, conjunctivitis and corneal damage.

Potential Risks: This reagent used in the manufacture of methamphetamine can cause irritation of eyes, lungs and skin. Overexposure may lead to pulmonary edema or even death. Individuals most at risk are those present during the manufacturing process.

Thorium oxide (CAS 1314-20-1)

Form: Solid, white crystals (sand-like), odorless

Use: Catalyst for P2P synthesis

Physical properties: Melting point 3390°C (6134°F), boiling point 4400°C (7952°F)

Exposure limits: None available other than general standards for radioactive materials

Hazards: Thorium is a radioactive alpha-emitter, which is toxic if ingested or inhaled.

Carcinogen

Potential Risks: A catalyst for P2P synthesis, thorium oxide in a radioactive material and is toxic if ingested or inhaled. It is most harmful to those having chronic exposure, such as children and others inhabiting the laboratory.

Toluene (CAS 108-88-3)

Form: Clear, colorless liquid, benzene-like aroma

Use: Solvent used in manufacture of P2P and methamphetamine

Physical properties: Boiling point 111°C (232°F), vapor pressure 22 mmHg, vapor density 3.14

Exposure limits: TLV-TWA 50 ppm, IDLH 500 ppm

Hazards: Inhalation may cause irritation of the skin, nose, throat, and lungs, as well as nausea, weakness, drunkenness, confusion, and loss of consciousness. Highly flammable.

Potential Risks: It is an irritant to the skin and respiratory system, and has significant effects on the nervous system. It is highly flammable, making it a hazard for first responders as well as those present during the manufacturing process.

1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon) (CAS 76-13-1)

Form: Clear, colorless liquid, slight ethereal odor

Use: Solvent used to extract d-methamphetamine

Physical properties: Boiling point 47°C (117°F), Vapor pressure 284 mmHg, vapor density 6.5

Exposure limits: TLV-TWA 1000 ppm, STEL 1250 ppm, IDLH 2000 ppm

Hazards: Vapor can cause eye irritation, burning and damage. Inhalation can cause sudden cardiac death. Freon interferes with the heart's rhythm. Symptoms may include slurring, vomiting, drunkenness, coma, and death. Potential Risks: Freon is used as a solvent to extract d-methamphetamine. The vapor can cause eye irritation and damage. Inhalation can be deadly. This solvent is a serious health hazard to individuals present during the manufacturing process.