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**MATERIAL SAFETY DATA SHEET**


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**1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

Product name: **Z-5**

(Product as sold: concentrate)  
(Product as used by consumer: diluted)

**Catalog number:** 182**General use:** Fixative in histology and surgical pathology, specifically to replace fixatives containing mercury and picric acid.**Description of product as sold:** Aqueous solution of formaldehyde, zinc, buffer and indicator.**Description of product as used by consumer:** Solution of formaldehyde, zinc, buffer and indicator in ethanol or reagent alcohol and water.**Manufacturer**

Anatech Ltd.  
1020 Harts Lake Road  
Battle Creek, MI 49037  
USA

**Emergency contact information**

Health:	Anatech Ltd.	800-262-8324	8 am - 5 pm ET, M-F
Transportation:	CHEMTREC	800-424-9300	24 hours

**2. COMPOSITION AND INFORMATION ON INGREDIENTS**

(Note: Percentage composition is withheld as a trade secret.)

**Product as sold (concentrate)****Component****CAS #****Exposure limits**

Formaldehyde

50-00-0

0.75 ppm (OSHA 8 hour TWA)  
2.0 ppm (OSHA 15 minute STEL)  
0.5 ppm (OSHA Action Level)  
0.3 ppm (ACGIH Ceiling)  
0.1 ppm (NIOSH Ceiling)  
20 ppm (NIOSH IDLH\*)

\* Immediately dangerous to life and health

Methanol  
(stabilizer in formaldehyde)

67-56-1

200 ppm (OSHA, NIOSH, ACGIH 8 hour TWA)  
250 ppm (ACGIH Ceiling)  
6000 ppm (NIOSH IDLH\*)

\* Immediately dangerous to life and health

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**2. COMPOSITION AND INFORMATION ON INGREDIENTS (continued)**

<u>Component</u>	<u>CAS #</u>	<u>Exposure limits</u>
Zinc (ionized)	Proprietary	Not established; generally considered not hazardous.
Buffer	Proprietary	Not established; generally considered not hazardous.
Indicator	Proprietary	Not established; generally considered not hazardous.
<b>Product as used (diluted by consumer)</b>		
Formaldehyde	50-00-0	0.75 ppm (OSHA 8 hour TWA) 2.0 ppm (OSHA 15 minute STEL) 0.5 ppm (OSHA Action Level) 0.3 ppm (ACGIH Ceiling) 0.1 ppm (NIOSH Ceiling) 20 ppm (NIOSH IDLH*)  * Immediately dangerous to life and health
Methanol (stabilizer in formaldehyde)	67-56-1	200 ppm (OSHA, NIOSH, ACGIH 8 hour TWA) 250 ppm (ACGIH Ceiling) 6000 ppm (NIOSH IDLH*)  * Immediately dangerous to life and health
Zinc (ionized)	Proprietary	Not established; generally considered not hazardous.
Buffer	Proprietary	Not established; generally considered not hazardous.
Indicator	Proprietary	Not established; generally considered not hazardous.
Ethanol	64-17-5	1000 ppm (OSHA, ACGIH 8 hour TWA)

Note: If reagent alcohol is used, additional amounts (<3%) of methanol and isopropanol will be present.

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**3. HAZARDS IDENTIFICATION**

<b>Emergency overview</b>
<p>Clear liquid; pink color as concentrate, essentially colorless when diluted; strong odor of formaldehyde.</p> <p>Caution. Contains formaldehyde. Toxic by inhalation and if swallowed. Irritating to the eyes, respiratory system, and skin. May cause sensitization by inhalation or by skin contact. Risk of serious damage to eyes. Potential cancer hazard; repeated or prolonged exposure increases the risk.</p> <p>Properly diluted product is flammable.</p>

### 3. HAZARDS IDENTIFICATION (continued)

#### Potential health effects

(Human health effects only; animal effects in Section 11: Toxicological Information.)

**Primary route(s) of exposure:** Eyes, skin and inhalation.

**Inhalation:** Formaldehyde vapors are irritating to the nose, throat and lower respiratory system. Human systemic effects by inhalation include olfactory, pulmonary and personality changes.

**Eye:** Contact of liquid or vapor with eyes may cause irritation or burns.

**Skin:** Contact of liquid with skin may cause irritation.

**Ingestion:** Ingestion of formaldehyde is likely to produce seriously adverse effects on the gastrointestinal system. Violent vomiting and diarrhea leading to collapse have been reported.

**Chronic effects:** Formaldehyde is a carcinogen and sensitizer. Allergic reactions, including contact dermatitis resembling eczema, can occur with repeated exposures. Long term exposure increases the risk of lung and nasopharyngeal cancer, as well as asthma. Individuals can become acclimated to various formaldehyde vapor concentrations.

**Signs and symptoms:** Affected skin will appear dry, tough and perhaps cracked. Affected corneas may appear cloudy; eyes may water and become reddened. Effects on the gastrointestinal tract may include nausea and/or vomiting. Effects on the respiratory system may include coughing and difficulty in breathing. Medical conditions known to be aggravated by exposure to this solution include asthma.

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### 4. FIRST AID MEASURES

**Inhalation:** Remove victim to fresh air if coughing or difficulty in breathing is experienced. Consult a physician if symptoms persist or worsen. Administer oxygen or artificial respiration as needed.

**Eye:** Flush eyes for at least 15 minutes in an eyewash station. If symptoms persist after washing, consult a physician.

**Skin:** Remove contaminated clothing, including footwear; wash before reuse or discard. For minor exposure, wash affected area with water and mild soap, rinsing thoroughly; apply a good quality skin lotion. In cases of prolonged, repeated or extensive exposure, rinse affected area or entire body for at least 15 minutes. For severe conditions, consult a physician.

**Ingestion:** Call a poison control center immediately. If victim is conscious, have him/her drink several glasses of water to dilute the solution. Induce vomiting only upon the advice of a physician or poison control authority.

**Note to physician:** Z-5 is a histological fixative. If ingested, it will fix lining cells of the gastrointestinal tract.

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### 5. FIRE FIGHTING MEASURES

#### Flammable properties

**Flash point:** For concentrate: > 200°F (>93°C), closed-cup.  
For diluted solution: 80°F (27°C), closed-cup.

**Flammable limit:** Not determined.

**Autoignition temperature:** Not determined.

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## 5. FIRE FIGHTING MEASURES (continued)

**Flammability classification:** For concentrate: Combustible liquid (OSHA).  
For diluted solution: Flammable liquid (OSHA).

**Flame propagation:** None with the concentrate. With diluted solution, vapors can travel to source of ignition and flash back to liquid if vapor temperature exceeds flash point.

**Hazardous products of combustion:** Emits toxic vapors (formaldehyde); in addition, the diluted solution produces carbon monoxide and carbon dioxide.

**Extinguishing media:** ABC rated portable fire extinguishers should be used. Professional fire fighters may use water spray, dry chemical or carbon dioxide.

**Fire fighting instructions:** Sealed chemical suits and self contained breathing apparatus are necessary for fighting formaldehyde fires involving substantial volumes of this product.

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## 6. ACCIDENTAL RELEASE MEASURES

The size of a spill is defined in part by the local situation, especially regarding ventilation. At room temperature in a well ventilated room, a few hundred milliliters might be considered a small spill. Toxic formaldehyde vapors (and flammable vapors from the diluted solution) are generated during a spill and may exceed OSHA's Permissible Exposure Limits. Wear protective gloves, rubber boots, impermeable aprons and full-face respirators. Use a damp sponge or mop to remove spilled liquid, or neutralize the aqueous product with a commercial kit (not recommended for the dilute solution because of the alcohol). Wash contaminated area with water. Discard absorbents and other contaminated solids in a receptacle suitable for hazardous chemical waste. Liquid waste may be discarded down the drain with approval by wastewater authorities, or may be removed by a licensed waste hauler.

With large spills, evacuate the area and have an emergency response team perform the cleanup. Have a licensed waste hauler remove contaminated solids and recovered liquid.

Comply with all applicable governmental regulations on spill reporting and on the handling and disposal of hazardous waste.

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## 7. HANDLING AND STORAGE

**Handling:** Wear a plastic or rubber apron, protective gloves and splash-proof goggles; this is mandated by OSHA. Avoid all contact with skin and eyes. Do not continue to wear contaminated clothing after a spill. Do not heat or microwave the solution, as vapor levels may become immediately dangerous to life and health.

**Storage:** Store at room temperature. Store the diluted product in a flammable storage cabinet.

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## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

**Engineering controls:** Good general room ventilation is essential. Product should be used with local ventilation (fume hood).

### Personal protective equipment

**Respiratory protection:** A NIOSH-approved respirator suitable for formaldehyde must be used if vapor levels exceed the exposure limits.

**Skin protection:** OSHA mandates the use of gloves; Anatech Ltd. recommends nitrile gloves. Do not use latex surgical gloves for protection against any hazardous liquid. An eyewash station and safety shower must be nearby, preferably in the same room, no more than 10 seconds away.

**Eye protection:** OSHA mandates the use of splash-proof goggles. Do not use safety glasses. If a face shield is worn as protection against biohazards, splash-proof goggles also must be used. Anatech Ltd. believes that the use of contact lenses is ill advised when handling formaldehyde solutions. An eyewash station and safety shower must be nearby, preferably in the same room, no more than 10 seconds away.

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## 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance:** Product as sold is pink; properly diluted solution is essentially colorless liquid.

**Odor:** Pungent (formaldehyde) odor.

**Physical state:** Liquid.

**pH:** 4.2 - 4.8 (concentrate); 5.5 - 6.1 (diluted).

**Vapor pressure:** Not determined.

**Vapor density:** Not determined.

**Boiling point:** 207°F (97°C) (concentrate); not determined (diluted).

**Freezing point:** Not determined (concentrate); not determined (diluted).

**Solubility in water:** Complete.

**Specific gravity:** 1.038 at 20°C (concentrate); not determined (diluted).

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## 10. STABILITY AND REACTIVITY

**Chemical stability:** Stable.

**Conditions to avoid:** Heating this solution will give off irritating and potentially life-threatening vapors. Dilute solution is flammable; keep away from heat, sparks and flames.

**Incompatibility with other materials:** Strong oxidants, ammonia, chlorine bleach or hydrochloric acid. Mixing with phosphate solutions leads to precipitation of the zinc.

**Hazardous decomposition products:** None.

**Hazardous polymerization:** None.

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## 11. TOXICOLOGICAL INFORMATION

**Acute eye effects:** Eye irritation threshold in humans is 3-10 ppm; lacrimation and discomfort at lower levels in some individuals; contact with the solution may fix the cornea and surrounding tissue. In rabbits, 50 µg of 37% formaldehyde solution over 24 hours produced severe irritation.

**Acute skin effects:** Contact with the solution may fix the skin, killing surface cells and causing drying, hardening and cracking.

**Acute oral effects:** OSHA considers chemicals to be toxic if their LD<sub>50</sub> is at or below 500 mg/kg. LD<sub>50</sub> is the dose killing 50% of the test animals in a given time (usually 4 hours); LD<sub>Lo</sub> is the lowest dose causing death. Using 37% formaldehyde solution, the LD<sub>50</sub> was 260 mg/kg in guinea pigs, 800 mg/kg in rats and 42 mg/kg in mice. In humans, the LD<sub>Lo</sub> is 108 mg of 37% formaldehyde solution/kg.

**Acute inhalation effects:** OSHA considers chemicals to be toxic if their LC<sub>50</sub> is at or below 20 mg/kg. LC<sub>50</sub> is the airborne concentration killing 50% of the test animals; LC<sub>Lo</sub> is the lowest concentration causing death. Using 37% formaldehyde solution, the LC<sub>50</sub> was 590 mg/kg; the LC<sub>Lo</sub> in humans was 17 mg/kg.

**Chronic effects/carcinogenicity:** Formaldehyde is an OSHA carcinogen and sensitizer.

**Teratology:** None known.

**Reproductive effects:** None known.

**Mutagenicity:** Positive.

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## 12. ECOLOGICAL INFORMATION

**Ecotoxicity:** The following data are from studies using 37% formaldehyde in flow-through bioassays.

Rainbow trout: 96 hr LC<sub>50</sub> = 118 µl/l  
Atlantic salmon: 96 hr LC<sub>50</sub> = 173 µl/l  
Lake trout: 96 hr LC<sub>50</sub> = 100 µl/l  
Black bullhead: 96 hr LC<sub>50</sub> = 62.1 µl/l  
Channel catfish: 96 hr LC<sub>50</sub> = 65.8 µl/l  
Green sunfish: 96 hr LC<sub>50</sub> = 173 µl/l  
Bluegill: 96 hr LC<sub>50</sub> = 100 µl/l  
Smallmouth bass: 96 hr LC<sub>50</sub> = 136 µl/l  
Largemouth bass: 96 hr LC<sub>50</sub> = 143 µl/l

**Environmental fate:** Formaldehyde is oxidized to formic acid, then to carbon dioxide and water, or reduced to methanol, then to carbon dioxide and water. Ethanol (in the diluted product) is readily decomposed to carbon dioxide and water. Zinc salts of low toxicity would remain.

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## 13. DISPOSAL CONSIDERATIONS

The concentrate is toxic (formaldehyde); the diluted solution is flammable (ethanol) and toxic. Both should be disposed via a licensed waste hauler. Do not mix waste streams unless instructed to do so by your waste hauler.

Some wastewater treatment authorities may grant permission for drain disposal of limited amounts of concentrate or diluted solution. The zinc content of properly diluted material is < 600 ppm. Z-5 is not recyclable. It is not

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**13. DISPOSAL CONSIDERATIONS (continued)**

recommended to neutralize formaldehyde in the diluted product because of the alcohol content. Canadian disposal regulations generally parallel those in the United States.

Regardless of the method chosen for disposal, be sure to follow federal, state (provincial) and local regulations. Proper waste disposal is the generator's responsibility.

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**14. TRANSPORTATION INFORMATION**

Packaging for hazardous shipments must meet the specifications as required by the current editions of *International Air Transportation Association (IATA) Dangerous Goods Regulations* and the United States Department of Transportation *49 CFR*.

**For product as sold (concentrate)**

**DOT (ground):** Not regulated.

**DOT (air) and IATA:** **Proper Shipping Name:** Aviation regulated liquid, n.o.s. (formaldehyde)  
**UN #:** 3334  
**Hazard Class:** 9  
**Packing Group:** None assigned.

**For diluted solution**

**DOT (ground and air) and IATA:** **Proper Shipping Name:** Flammable liquid, n.o.s. (ethanol)  
**UN #:** 1993  
**Hazard Class:** 3  
**Packing Group:** III

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**15. REGULATORY INFORMATION**

**OSHA (USA):** Under the Hazard Communication Standard, the Formaldehyde Standard and the Laboratory Standard, the product as sold is a hazardous material: it is an irritant, sensitizer and carcinogen, and it is toxic. Properly diluted Z-5 shares those hazard ratings and also is flammable.

Both the concentrate and the diluted solution are required to bear the OSHA hazard warning for formaldehyde:

Caution. Contains formaldehyde. Toxic by inhalation and if swallowed. Irritating to the eyes, respiratory system, and skin. May cause sensitization by inhalation or by skin contact. Risk of serious damage to eyes. Potential cancer hazard; repeated or prolonged exposure increases the risk.

The three OSHA Standards cited above mandate that exposed workers be monitored for formaldehyde exposure, and receive proper training in the properties of this product, work practices involved with its handling and disposal, and interpretation of its MSDS. Customers who in turn send this product on to their clients or satellite facilities must supply an MSDS at least with the initial shipment. This MSDS is suitable for either the product as sold or the properly diluted solution.

**FDA (USA):** Z-5 is for in vitro diagnostic use as a fixative in histology.

**EPA (USA):** For disposal purposes, formaldehyde is considered toxic. Properly diluted Z-5 is ignitable. Formaldehyde is a reportable substance under SARA Title III.

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**16. OTHER INFORMATION**

**Label warnings:** Caution. Contains formaldehyde. Toxic by inhalation and if swallowed. Irritating to the eyes, respiratory system, and skin. May cause sensitization by inhalation or by skin contact. Risk of serious damage to eyes. Potential cancer hazard; repeated or prolonged exposure increases the risk. Avoid extensive or repeated contact. Use with adequate ventilation. If swallowed, contact a physician.

Properly diluted product is flammable.

**Product logo:****NFPA (National Fire Protection Association) Rating:**

**General note:** This rating is applicable only to safeguard the lives of individuals who may be concerned with fires occurring in an industrial plant or storage location. The ratings provide information to emergency personnel on whether to evacuate the area or how to perform control procedures. It is not descriptive of hazards under normal conditions of occupational use, and is even less applicable to anticipated laboratory-scale use.

**For product as sold (concentrate)**

Health 2: Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

Flammability 1: Materials that must be preheated before ignition can occur.

Instability 0: Materials that are normally stable even under fire conditions.

**For diluted solution**

Health 2: Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

Flammability 3: Materials that can be ignited under almost all ambient temperature conditions.

Instability 0: Materials that are normally stable even under fire conditions.