Product Safety Assessment

*DOW™ Tin-Plating Process Products*


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**Names**
- CATAPOSIT™ 44 catalyst concentrate
- CATAPOSIT 449 replenisher
- CÍRCUPOSIT™ catalyst 3344/4444
- ENLIGHT™ tin series plating products
- PLUTIN™ series plating products
- SATIN™ series plating products
- TIN GLEAM™ series plating products
- TINPOSIT™ series plating products
- CAS No. 7772-99-8, Stannous chloride, tin dichloride
- CAS No. 53408-94-9, Tin(II) methanesulphonate, tin methanesulphonate, tin(II) methanesulfonate, tin methanesulfonate
- CAS No. 7488-55-3, Stannous sulfate, tin sulfate
- CAS No. 20667-12-3, Silver oxide
- CAS No. 7439-92-1, Lead
- CATAPOSIT PM-957 catalyst
- CATAPOSIT PM-959 catalyst
- CRIMSON™ activator 5300 B
- CRIMSON activator 5300 C
- RONASTAN™ series plating products
- SOLDERON™ series plating products
- TINGLO CULMO™ series plating products

**Product Overview**
- Most DOW™ tin-plating process products contain tin (some do not but are used as part of the plating line). DOW tin-containing plating products are usually sold as concentrates. These products are typically pale yellow to dark brown, water-based solutions of soluble tin compounds including, but not limited to, tin methanesulfonate, tin sulfate, and tin dichloride. A few concentrates are sold as grey-white powders. The liquid and powder products (and other tin-free concentrates), which are used to maintain the plating system, may contain buffers to control pH and other additives that improve the quality or properties of the plated tin deposit.¹²³ For further details, see Product Description.
- A number of DOW products must be used in conjunction with tin-containing plating products. In some instances, customers procure the tin source from other companies and add it to DOW plating products during plating bath make-up and replenishment. Although these products do not contain tin, they are addressed by this Product Safety Assessment.
Product Safety Assessment: DOW™ Tin-Plating Process Products

- DOW™ tin-plating process products are used for depositing tin or tin-silver on electronic components as a replacement for lead solder. Some products are used to create decorative finishes on plastic parts and others are used to plate steel used to make tin cans. Dow also offers tin-plating process products that deposit traditional tin-lead and lead-tin solder. DOW tin-plating process products are designed for either electrolytic (using electrical current) or electroless (non-electrical) plating applications. For further details, see Product Uses.

- The highest exposure potential is the inhalation of mists or aerosols by employees of plating facilities. Plating facilities should have a thorough training program for employees and appropriate work processes, ventilation, and safety equipment in place to limit exposure. Consumer exposure to DOW tin-plating products is unlikely, although consumers are likely to come into contact with tin-plated articles, which are not considered hazardous. For further details, see Exposure Potential.

- DOW tin-plating process products are typically corrosive to the eyes, skin, respiratory tract (inhalation), and mouth, throat, and digestive tract (ingestion). Prolonged, repeated contact may cause an allergic skin reaction or result in toxic effects to internal organ systems. Some products contain compounds that may cause cancer or compounds that have been reported to cause mutagenic or teratogenic effects in animal studies. For further details, see Health Information.

- DOW tin-plating process products are considered environmentally hazardous and toxic to aquatic organisms. Tin-plated consumer goods are not considered hazardous to the environment. For further details, see Environmental Information.

- DOW tin-plating process products are not combustible and are stable at normal storage and operating temperatures. The plating products should not be stored with strong oxidizing agents, reducing agents, or cyanide compounds. In addition, they should not be mixed with strong oxidizers, reducing agents, or cyanide compounds unless the Technical Data Sheet specifically directs such operations. For further details, see Physical Hazard Information.

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Manufacture of Product


- Process – DOW™ tin-plating process products are prepared according to proprietary formulations. These products are prepared by batch processes. This involves blending raw materials in mix tanks to customer specifications, then packaging them for distribution.

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Product Description

DOW™ tin-plating process products are pale yellow to dark brown, water-based solutions of soluble tin compounds, including but not limited to tin methanesulfonate, tin sulfate, and tin dichloride. The products are packaged in a variety of container options that routinely include 5-gallon and 55-gallon drums. Several products are produced and sold as grey-white powder concentrates, which are packaged in 5-kilogram and 10-kilogram plastic pails.

Because of the diverse uses (plating bath set-up and replenishment) and specific product applications, DOW tin-plating process products are sold under a variety of trade names, as outlined in the Names section of this Product Safety Assessment.
Product Uses

DOW™ tin-plating process products have two principal uses:

- Electronic components, printed circuit boards, and associated wires and metal contacts (90%)
- Coating steel rolls in steel mills (10%)

**Electronic components** – In the production of printed circuit boards, DOW tin-plating process products are used to create a temporary protective layer that is later removed from the circuit board. In these applications, the tin protects the underlying copper circuitry during subsequent processing steps. Tin is also used in the catalyst designed to “seed” the nonconductive surfaces of printed circuit boards so that subsequent deposition of copper can take place. In this case, the tin is also removed before copper deposition.

Tin-containing products are also used to produce a semi-permanent coating on a variety of electronic components including connectors, lead frames, wire, silicon chips, chip resistors, capacitors, and diodes, which are subsequently assembled onto circuit boards. The deposited tin is either pure tin or an alloy with either lead or silver. These deposits assist in the soldering of the component to the circuit board. The tin or tin alloy deposited on the component remains in the final consumer electronic device (e.g., cell phone, television) as part of a solder joint connection between the component and the circuit board.

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**Product Uses**

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Decorative finishes – Tin-containing catalysts are also used to produce decorative finishes that simulate the appearance of metal on plastic parts such as automotive trim (internal and external), decorative containers/bottles, and plumbing fixtures, such as faucets.

Steel-mills – DOW tin-plating process products produce a pure tin layer on the entire surface of steel strips (rolled sheets as shown below). The steel is subsequently stamp-cut to make tin cans.

Exposure Potential

DOW™ tin-plating process products are used in the production of industrial and consumer products. Based on the uses for these products, the public could be exposed through:

• Workplace exposure – Exposure can occur either in a manufacturing facility that produces these products or in the various industrial plating facilities that use these products. These products are produced, distributed, and stored in semi-closed systems. Manufacturing processes do not involve tin in either a solid or dust form. Tin compounds are handled by Dow employees and customers only as liquid solutions. This mitigates the potential for inhalation exposure, which is the primary route of concern in the workplace. Dermal exposure from incidental contact is possible for those working with these products in manufacturing operations or during maintenance, sampling, testing, or other procedures. Each plating facility should have a thorough training program for employees and appropriate work processes, ventilation, and safety equipment in place to limit unnecessary exposure. See Health Information.

• Consumer exposure to DOW tin-plating process products – Dow does not sell these products for direct consumer use, but they are used to produce products that consumers may use. However, consumers would contact only the relatively harmless tin finish, not the original plating products. See Health Information.

• Environmental releases – In the event of a spill, the focus is on containing the spill to prevent contamination of soil and surface or ground water. Small spills should be absorbed

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with inert materials such as sand or soil and disposed of as hazardous waste. If released to the environment, these materials are likely to partition to the water phase since the products are water soluble. They are considered very toxic to aquatic organisms on an acute basis. See Environmental, Health, and Physical Hazard Information.

- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, the material should be captured, collected, and reprocessed or disposed of according to applicable governmental requirements. Notify authorities if a spill has entered a waterway or sewer or has contaminated soil or vegetation. See Environmental, Health, and Physical Hazard Information.

- **In case of fire** – Deny any unnecessary entry into the area. These products are not combustible. Use an extinguisher that is suitable for the surrounding material to fight the fire. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing. Hazardous vapors may be released in a fire. Follow emergency procedures carefully. See Environmental, Health, and Physical Hazard Information.

For more information, request the Safety Data Sheet from the Dow Customer Information Group.

**Health Information**

Health information for DOW™ tin-plating process products is summarized on the relevant Safety Data Sheets. It is important to note that health risks associated with individual products may vary based on their formulation or intended use. The Safety Data Sheet is the preferred source for specific health information. These materials may also contain a variety of other components or additives that have additional health risks. An overview of health information for these products appears below.

- **Eye contact** – Most products can be corrosive to the eyes, causing pain and burns to the eye. A few of these products are less acidic and are considered eye irritants.

- **Skin contact** – Most products can be corrosive to the skin. The less acidic products are irritating to the skin. Due to the tin content, these products have the potential to cause allergic skin reactions.

- **Inhalation** – These products are irritating to the nose, throat, and respiratory tract. Inhalation of acidic vapors can damage the respiratory system. Inhalation may lead to allergic sensitization due to the tin content.

- **Ingestion** – Most products are acidic liquids and can be corrosive to the mouth, throat, and digestive tract if swallowed. The less acidic products may only be irritating. Ingestion may cause adverse effects to internal organ systems.

- **Other** – Most products contain tin compounds that may cause cancer from inhalation exposure. Most products are formulated and sold as liquid solutions, which are not aerosolized during manufacture, so there is little chance for inhalation exposure. During customer use there is some chance for inhalation exposure to aerosol mists, which could contain tin compounds emitted from the plating baths.

In addition to carcinogenic effects, mutagenic or teratogenic effects have been reported in animal studies involving tin compounds. Some products also contain boric acid or bismuth, cadmium, cobalt, or lead compounds. Mutagenic or teratogenic effects and adverse effects on the male reproductive system have been reported in laboratory animals for some of these compounds.
Environmental Information

Because of their high water solubility, if released to the environment, most DOW™ tin-plating process products would tend to partition to nearby water resources. These products are commonly acidic solutions that may contain a variety of tin, copper, gold, indium, palladium, tin, and/or zinc compounds. These products can also contain bismuth, boron, cadmium, cobalt, and/or lead compounds as stabilizers. Most of these compounds are considered environmentally hazardous and can be very toxic to aquatic organisms.

Standard wastewater-treatment practices are used during product manufacture and by customers during processing. These practices neutralize the acidic nature of the products prior to discharge to the environment. These practices also use metal precipitation and/or chelation techniques to reduce metal discharges to levels that comply with established local and state discharge limits. These limits are designed to protect aquatic organisms and the environment.

Physical Hazard Information

DOW™ tin-plating process products are not combustible and are stable at normal storage and operating conditions. Most products are acidic liquids and should be stored in the original container in cool, dry, well-ventilated area out of direct sunlight and away from incompatible materials.

DOW tin-plating process products should not be stored with strong oxidizing agents, reducing agents, or cyanide compounds. In addition, they should not be mixed with strong oxidizers, reducing agents, or cyanide compounds unless Dow’s product use instructions (e.g., Technical Data Sheet) specifically direct such operations.

Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of DOW™ tin-plating process products. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant Safety Data Sheet, Technical Data Sheet, or Contact Us.

Additional Information

- Request Safety Data Sheet (www.dow.com/assistance/dowcig.htm)
- Contact Us (www.dow.com/assistance/thoughts.htm)
- “Carcinogenesis Bioassay of Stannous Chloride (CAS No. 7772-99-8) in F344/N Rats and B6C3F1/N Mice (Feed Study),” National Toxicology Program Report #231, U.S. Department of Health and Human Services (http://ntp.niehs.nih.gov/ntp/htdocs/LT_rpts/tr231.pdf)


References

NOTICES:

As part of its 2015 Sustainability Goals, Dow has committed to make publicly available safety assessments for its products globally. This product safety assessment is intended to give general information about the chemical (or categories of chemicals) addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the relevant Safety Data Sheet, which should be consulted before use of the chemical. This product safety assessment does not replace required communication documents such as the Safety Data Sheet.

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