Product Safety Assessment
BIOBAN™ IPBC 100 Antimicrobial

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Names
• CAS No. 55406-53-6
• IPBC
• 3-Iodo-2-propynyl butyl carbamate
• Carbamic acid, butyl-3-iodo-2-propynyl ester
• Iodopropynyl butylcarbamate
• BIOBAN™ IPBC 100 Antimicrobial
• 3-Iodopropynylbutylcarbamate
• Butyl-3-iodo-2-propynylcarbamate

Product Overview
• Pure iodopropynyl butylcarbamate (IPBC) is an off-white solid with a faint odor of iodine. IPBC is not readily water soluble, but is very soluble in methanol and other organic solvents. It is slightly acidic, has low vapor pressure, and is not flammable. ¹ For further details, see Product Description.
• BIOBAN IPBC 100 Antimicrobial is a dry-film fungicide* meaning it inhibits the growth of mold and mildew in masonry materials, paints, coatings, wood stains, and above-the-ground wood preservatives. This fungicide is also used in paper coatings, inks, adhesives, sealants and cordage, and metalworking fluids.² For further details, see Product Uses.
• Based on the applications in which it is used, occupational exposure to IPBC may occur by inhalation or skin contact. It is likely that consumers will come into contact with materials that contain IPBC in dilute form; however, the concentrations present in these products should not pose unacceptable health risks if instructions for use are followed carefully.³ For further details, see Exposure Potential.
• Eye contact with IPBC may cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur. Prolonged skin contact may cause severe irritation with local redness and discomfort. This material is harmful if absorbed through the skin. Skin contact may cause an allergic skin reaction in a small proportion of individuals. IPBC may be toxic if inhaled, however, the degree of toxicity is dependent on the particle size of the material.¹ ⁴ For further details, see Health Information.

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²This product is not registered in all regions for all applications. Please contact your local Dow representative for detailed technical information applicable to your individual situation.
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- Based on stringent OECD test guidelines, IPBC is not considered readily biodegradable; however, it does biodegrade slowly in the environment. Its bioaccumulation potential (tendency to accumulate in the food chain) is low. IPBC is acutely toxic to fish, invertebrates, and algae. For further details, see Environmental Information.
- IPBC is thermally stable at room temperature and under normal storage and use conditions for a period of at least 60 months. IPBC decomposes when heated above 85°C (185°F). Avoid contact with strong acids and strong bases. For further details, see Physical Hazard Information.

Manufacture of Product
- **Capacity** – Dow is a supplier of IPBC technical material and satisfies the global demand of Dow’s customers for this product.
- **Process** – The manufacturing process of BIOBAN™ IPBC 100 Antimicrobial is proprietary. The chemical structure of IPBC is shown below:

Product Description

Pure iodopropynyl butyl carbamate (IPBC) is an off-white solid with a faint odor of iodine. It is used as an active substance for formulation of antimicrobial products. It is effective against a wide range of fungal species, such as *Aspergillus niger* and *Trichoderma viren* (molds or mildew). In addition to BIOBAN™ IPBC 100 Antimicrobial, Dow sells 20 and 40% dilutions of IPBC in organic solvents.

BIOBAN IPBC 100 Antimicrobial contains no organometallic compounds and is compatible with both aqueous and solvent-based formulations. IPBC is not very water soluble, but is very soluble in methanol and other organic solvents. It is slightly acidic, has a low vapor pressure, and is not flammable.

Product Uses

IPBC is used as a preservative in a wide variety of applications, including:
- **Surface and building materials** – for treatment of tiling joint fillers, grouts, and other building materials, plaster plates applied on buildings (indoor), and surface materials applied on buildings.
- **Interior and exterior paints** – for treatment of solvent and waterborne paints and stains
- **Coatings** – paper and cardboard substrates coatings—non-food contact applications only
- **Wood protective stains and above-the-ground wood preservatives** – for preservation of interior or exterior protective coatings, engineered wood products, and millwork

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Exposure Potential

Based on the applications in which IPBC is used, the public could be exposed through:

- **Workplace exposure** – Professionals working with IPBC in manufacturing and/or formulating operations could be exposed during maintenance, sampling, testing, or other procedures. The most likely routes of exposure are dermal or inhalation. Use of recommended industrial controls and personal protective equipment (PPE) will limit exposure under most conditions. For workers using products containing IPBC as a preservative, IPBC is generally used between 0.02–3.00% by weight of the formulation depending on the application, and exposure is further limited through use of appropriate PPE. See Health Information.

- **Consumer exposure to products containing IPBC** – BIOBAN™ IPBC 100 Antimicrobial is not sold for direct consumer use, but it is formulated into products used by the general public, such as adhesives and paints. The concentration of BIOBAN IPBC 100 Antimicrobial in these products is low (maximum 0.80% by weight of formulation); hence, the concentrations present in these products should not pose unacceptable health risks if labels for use are followed carefully. See Health Information.

- **Environmental releases** – IPBC is very toxic to aquatic organisms such as fish, invertebrates, and algae. In the event of a spill, the focus is on containing and recovering the spilled material quickly to prevent contamination of soil and surface or ground water. See Environmental, Health, and Physical Hazard Information.

- **Large release** – If a large spill does occur, ventilate area of leak or spill. The material should be captured, collected, and reprocessed or disposed of according to applicable governmental requirements. Positive-pressure, self-contained breathing apparatus (SCBA) with a full-face mask approved by the National Institute of Occupational Safety and Health (NIOSH) is recommended for emergency work. When relevant in scale or risk, the community should be notified of the hazards associated with the specific release event. See Environmental, Health, and Physical Hazard Information.

- **In the event of a fire** – Keep people away. Isolate fire and deny unnecessary entry. Use water fog or fine spray, dry chemical fire extinguishers, carbon dioxide extinguishers, or foam. A direct water stream may spread the fire. A foam fire extinguishing system is preferred. Contain fire run-off if possible. Firefighters should wear a positive-pressure SCBA and protective fire-fighting clothing. Consider the use of unmanned hose holders or monitor nozzles. Containers may rupture in a fire situation. See Environmental, Health, and Physical Hazard Information.

For more information, request the relevant Safety Data Sheet by using Contact Us.
Health Information\textsuperscript{1,4}

**Eye contact** – Eye contact with IPBC may cause severe irritation with corneal injury which may result in permanent impairment of vision, even blindness. Chemical burns may occur.

**Skin contact** – Brief skin contact may cause slight irritation with local redness. Prolonged skin contact may cause severe irritation with local redness and discomfort. Contact may cause drying and flaking of the skin. IPBC is of low acute toxicity by the dermal route. It is a suspected skin sensitizer as it has caused allergic skin reactions when tested in laboratory animals. Skin contact with IPBC may cause an allergic skin reaction in a small proportion of individuals.

**Inhalation** – IPBC may be toxic if inhaled; however, the degree of toxicity is dependent upon the particle size of the material.

**Ingestion** – This material is harmful if swallowed. Studies in laboratory animals have shown that IPBC meets European criteria for moderate acute toxicity by the oral route.

**Other** – An extensive toxicological database exists on the active substance IPBC. Animal studies have shown that repeated exposure to IPBC when administered orally has affected the liver and kidneys. No adverse systemic effects occurred via the dermal and inhalation routes. Based on animal testing, IPBC is not a genotoxic substance. Studies in two animal species have shown that IPBC is not carcinogenic. IPBC did not affect fertility and did not cause developmental toxicity in several animal studies. IPBC was toxic to the fetus in animals at doses toxic to the mother. The evidence suggests that this substance does not possess significant potential with respect to toxicity to reproduction. Additionally, IPBC was not neurotoxic when administered via the oral route.

For more information, request the relevant Safety Data Sheet by using [Contact Us].

Environmental Information\textsuperscript{1,7}

IPBC is stable to hydrolysis at environmentally relevant pH, and is stable to photolysis. The vapor pressure of IPBC is very low, resulting in negligible exposure to the atmosphere.

Based on stringent OECD test guidelines, IPBC is not considered readily biodegradable; however, it does biodegrade slowly in the environment. IPBC is metabolized rapidly in soil in laboratory experiments, and the primary degradate is propargyl butyl carbamate (PBC), which is further metabolized. IPBC has a medium to high mobility potential in soil.

Its bioaccumulation potential (tendency to accumulate in the food chain) is low.

The acute and long-term effects of IPBC are well documented. IPBC is acutely toxic to fish, invertebrates, and algae. The data reveal algae to be the most sensitive species. However, the acute data on the degradate PBC clearly reveal that PBC has a substantially lower toxicity to aquatic organisms than IPBC.

In addition, its toxicity to terrestrial organisms is documented by acute studies in earthworms, terrestrial micro-organisms, and terrestrial plants. The data reveal plants (*Avena sativa*) to be the most sensitive species.

Due to the toxicity of IPBC to aquatic organisms, the product should not be allowed to enter into sewers or be spilled on the ground or into any body of water.

For more information, request the relevant Safety Data Sheet by using [Contact Us].
Physical Hazard Information

BIOBAN™ IPBC 100 Antimicrobial is thermally stable at room temperature and under normal storage and use conditions for a period of at least 60 months. IPBC is a solid with a melting point above 50°C and does not ignite. It does not exhibit the potential for oxidation, flammability, or spontaneous decomposition. Decomposition can occur at elevated temperatures. Generation of gas during decomposition can cause pressure in closed systems. Pressure build-up can be rapid. Decomposition products depend on temperature, air supply, and the presence of other materials.

Avoid contact with strong acids and strong bases.

For more information, request the relevant Safety Data Sheet by using Contact Us.

Regulatory Information

Regulations exist that govern the manufacture, sale, transportation, use, and/or disposal of BIOBAN™ IPBC 100 Antimicrobial. 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

- Safety Data Sheet (request using Contact Us: http://www.dow.com/webapps/msds/msdssearch.aspx)
- Contact Us (http://www.dow.com/biocides/contact/index.htm)
- BIOBAN™ I-100 Antimicrobial, Technical Data Sheet, The Dow Chemical Company, Form No. 253-02566-10/15/08 PS, October 2008 (http://www.dow.com/biocides/lit/literature.htm)

References

1 BIOBAN™ I-100 Antimicrobial Safety Data Sheet, Dow Chemical Company Ltd
2 BIOBAN I-100 Antimicrobial, Technical Data Sheet, The Dow Chemical Company, Form No. 253-02566
6 European Chemicals Agency (http://echa.europa.eu/)

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