



FLAME RETARDANT FACT SHEET

Antimony Trioxide (Sb_2O_3)

SUMMARY PROFILE

Antimony is found in the earth's crust (average ca. 0.25 mg/kg) mostly associated with sulphur as stibnite. The manufacture of antimony trioxide (ATO) involves a sublimation reaction of antimony metal with oxygen that results in a cubic crystalline lattice formation. Antimony Trioxide (herein referred to as ATO) is a white crystalline powder of a ceramic character with very low solubility in water (CAS-No. 1309-64-4 and EINECS No. 215-175-0).

ATO is associated with Lead and Arsenic impurities which derive from the Stibnite ores mined from the earth. Lead is present as lead antimonate and Arsenic as an impurity in the crystal lattice with the occasional Arsenic atom replacing Antimony atoms. As a consequence of this both the Lead and Arsenic are not present as water soluble easily extracted species. Commercial ATO generally contains a maximum up to 0.25 % of Lead and up to 0.1% of Arsenic contaminants on a weight basis.

APPLICATIONS

- ❖ The major use of ATO is as a flame retardant synergist in plastics, paints, adhesives, sealants, rubber and textile back coatings where it is co-used with appropriate halogenated compounds usually Chlorine or Bromine based. Minor uses of ATO include as polymerisation catalyst used in PET resin manufacture, as a frictional additive in automotive brake linings, as a clarifying aid in certain glasses, as a coating used on certain grades of TiO_2 pigments, as a stabiliser in certain pigments based on Chromates and Molybdates and as an opacifier in cast iron bath and sinking enamelling.
- ❖ In ATO production and use care must be taken to keep the OEL (Occupational Exposure Limit), which is the amount of air-borne dust in a given volume of air, below the legal requirement of $0.5\text{mg}/\text{m}^3$ expressed as Sb per 8 hour time weighted average.
- ❖ To minimise and eliminate dust formation most ATO producers sell hygienic grades which include damped or wetted grades, pasted grades, granular and prilled grades and polymer bound masterbatch. These grades reduce and eliminate the dusting hazard associated with dry powder ATO.
- ❖ All workers involved in handling operations with ATO in the manufacture, compounding, converting, cleaning and recovery should be protected from inhalation exposure through appropriate industrial hygiene measures, the monitoring of occupational exposure, and engineering controls.

CLASSIFICATION AND LABELLING

- ❖ ATO is classified in the EU as Xn: Harmful and R40 (Limited evidence of a carcinogenic effect) according to 67/548/EC and its amendments. The classification as a Class 3 carcinogen and Class 2B by IARC means that ATO exhibits some evidence of carcinogenicity in animal tests (possible human carcinogen). The US EPA considers it as a suspected lung carcinogen.
- ❖ If the product is in a form which cannot generate air-borne dust, for example bound into a polymer matrix, then this classification will still be applicable, but the labelling will not. Appropriate information must still be transmitted to professional users, according to the specifications of EU Dangerous Substances and Preparations Directives, 67/548/EC and 1999/45/EC and their amendments.
- ❖ No need for ecotox labelling:
Solubility (1.86 mg/l) is lower than the ecotoxicity found on standard species (fish-
algae-daphnia), therefore no acute ecotoxicity classification (R50-52) is required according to OECD guidelines. Furthermore, a 28 days long-term (chronic) transformation/dissolution test indicated a solubility of 0.118 mg/l for ATO, which is lower than chronic toxicity for algae, fish & daphnia. It can therefore be concluded that there is no need for chronic classification (R53).
- ❖ Transport regulations:
Commercial grades of ATO contain below 0.50% Arsenic as an impurity and are therefore not subject to the provisions of ADR/RID, IMDG and IATA transport regulations. In the USA, larger big-bag type deliveries are subject to internal DOT regulations which do not apply to smaller and more usual 25 kg or 50 lb bag deliveries.

ENVIRONMENTAL / HEALTH ASPECTS

- ❖ ATO has been subject of a toxicological review by the WHO ([World Health Organisation](#)) in 2003 in which, following an extensive review of the latest scientific data, a WHO guideline value was increased from 5 µg/l to 20 µg/l in drinking water, reflecting increased margins of consumer safety. In January 2004, the EFSA ([European Food Safety Authority](#)) agreed with WHO and doubled the specific migration limit of ATO in food from 0.02 mg/kg to 0.04 mg/kg (making these less stringent). This limit has been implemented by Directive 2005/79/EC on 18 November 2005.
- ❖ Recent new scientific studies (year 2004 – 2005) sponsored by IAIOA (International Antimony Oxide Industry Association) in the framework of the Risk Assessment procedures, have confirmed these findings:
 - ATO is not a sensitizer, is not an eye irritant and is not a respiratory tract irritant. However, based on practical experience in the human worker population, it does produce skin irritation under hot and humid conditions due to penetration and irritation of the sweat glands. ATO shall therefore be labelled with R38.
 - ATO is not considered poisonous via oral ingestion. It has a high LD₅₀ value > 20 g/kg body weight. Sub-chronic administration also does not result in systemic toxicity even at high doses.
 - ATO is not a mutagen.
 - Oral absorption factor: < 1%
 - Dermal absorption factor: < 1%
 - Inhalation absorption factor: ~15%

BENEFITS

ATO increases the flame retardant effectiveness of halogenated flame retardants, thereby minimising their addition level. Without ATO synergists, around twice as much halogen compound would be needed to confer levels of flame retardancy required by legislation. Thus the use of ATO in halogenated flame retardant applications reduces costs and often enables physical properties to be improved. Its use as a flame retardant synergist allows the use of plastics in consumer products such as computer housings and TV sets that might otherwise pose too great a fire hazard. In specialist applications it provides unique properties not easily obtained through other products e.g. friction modification, light stability of inorganic pigments, stable opacifiers for high temperature enamelling.

ISSUES

❖ Reasons for special attention

- Classification as "Class 3 Carcinogen" via dust inhalation according to 67/548/EC and amendments, and as "Class 2B" according to IARC.
- Antimony oxide is restricted or excluded from some Eco Labels (some Blue Angel and EU Flower ecolabels) because of R 40-phrase or Class 3 carcinogen classification. Certain ecolabels also limit concentrations of "extractable" antimony in certain materials.

❖ National and international activities:

- There are no known legal restrictions (other than those based on voluntary eco labelling schemes) on the use of ATO as a flame retardant anywhere in the world. Certain countries stipulate that low or non-dusting product forms are used.
- Listed on 4th Priority List of Existing Substance Regulation (793/93/EC) leading to an EU Risk Assessment (with Sweden as Rapporteur). The EU Risk Assessment process is underway and is expected to be concluded end 2006. More detailed information to be found on www.iaioa.org.
- Antimony requires declaration in some of the Materials Declaration Guides produced or being developed in the electronics and electrical sector (E&E), for example by certain manufacturers and by the US EIA Electronic Industries Alliance www.eia.org/about

MANUFACTURERS / REFERENCES

- ❖ **IAOIA:** International Antimony Oxide Industry Association, c/o : Karine Van de Velde, IAOIA Secretary General, Tel: +32 478 327 562, <http://www.iaioa.org/>
- ❖ **EFRA:** European Flame Retardant Association, Dr. Brigitte Dero, Secretariat at CEFIC, Brussels, Tel. +32-2-676.72.59; Fax +32-2-676.73.92; email:bde@cefic.be; <http://www.cefic-efra.org>
- ❖ **UK HSE:** Published "Antimony and Antimony Compounds - Criteria document for an occupational exposure limit", 66 pages, 1996. Excellent overview on antimony trioxide. Copies can be obtained (at a cost of £10) from HSE books UK, telephone +44-1787-881165 and fax no. +44-1787-313995) www.hsebooks.com

Disclaimer: This information was compiled with great care and scrutiny – it reflects the current knowledge about this product at the time of completion of this record. This fact sheet is meant to provide users of the product and all interested parties information on health, environmental and regulatory issues. However, this is no replacement for a safety data sheet or any other legally required document. Furthermore, these data do not represent a specification of any commercial product.

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