

SILMAFLAME

**HALOGEN FREE & VERY LOW HALOGEN
FLAME RETARDANT MASTERBATCHES**

HALOGEN FREE & HYBRID TECHNOLOGY

- **What is Hybrid?**

Very Low Halogen (VLH) is the definition we use to describe an Hybrid technology based on Halogen Free FRs formulation boosted by the addition of a low level of Halogen FRs

- **Why Hybrid?**

SILMA likes to promote Halogen Free technology wherever possible, but actually this chemistry of Flame Retardants is not able to substitute completely the Halogen one, which is historically more old and developed

ACTUAL SITUATION

**THIS IS NOT A GOOD REASON TO CONTINUE TO USE POLYBROMINATED AND POLYCHLORINATED FRs
COMBINED ANTIMONY TRIOXIDE IN PLASTIC FORMULATIONS**

What happens during a fire :

Difficult for victims to escape due to the dense and black smokes, highly toxic and irritating

**Acid and corrosive gases damage the concrete reinforcement as well as electronic devices like PCs, Alarms,
Servers, Elevators, etc...**

Short survival time, death by inhalation

From the other side, Firefighters face problems while trying to extinguish the fire

WHY & WHAT

Antimony TriOxide (ATO) is always combined with organohalogen compounds to boost FR performance



Smokes containing
combination ATO/HALOGENS are :

High poisoning volatile species
Persistent and easy to be bio-absorbed



***Antimony and other heavy metals are demonstrated
to be toxic and cancerogenic substances***

TOXICITY REDUCTION

- Globally, over 400.000 deaths per year are caused by fires alone
- In Europe: about 12 fire victims and 120 people severely injured every day
- Principal cause of death is the inhalation of toxic fumes



BLACK SMOKES

**IT'S NECESSARY TO REDUCE
TOXICITY LEVEL OF FUMES**



WHITE SMOKES

CHANGE IS POSSIBLE

SILMAFLAME family offers a wide range of solutions to reduce the toxicity level of the fumes through the use of Halogen Free and Very Low Halogen formulations

Pure Halogen Free grades are based completely on Halogen Free Technology

Hybrid grades are normally used when Pure Halogen Free solutions do not achieve the required fire performance. These grades are Halogen Free according to various restrictive norms which define an upper limit of Halogen content between 1000ppm and 5000ppm into the final product.

The content of Halogen «Booster» is declared by Silma as nominal content considering the purity level of each molecule as a theoretic value of 100%, this method eliminates the possibility to exceed the norm limits when applied at the suggested dosage.

TECHNICAL & LEGAL REFERENCES

DIN VDE 0604-2-100 (Electrical & Electronics) < 1000 ppm (< 0.1%wt)

Based on determination of content of halogen by EN 14582 Oxygen Bomb method A
Extraction of halogens adsorbed in water after combustion with oxygen and Analysis
by Ion-Chromatography

IEC 61249-2-21 (Electronics) < 1500 ppm (< 0.15%wt)

Based on determination of content of halogen by EN 14582 Oxygen Bomb method A
Extraction of halogens adsorbed in water after combustion with oxygen and Analysis
by Ion-Chromatography

IEC 60754-1 (EN50267-2-1) and IEC 60754-2 (EN50267-2-2)

Based on determination of halogens emission and the degree of acidity and
conductivity of gases evolved during combustion. Strictly speaking, the **IEC 60754-1**
is fulfilled if halogens emission is **< 5000 ppm (< 0.5%wt)**, but to pass both the
norms, halogens content has to be usually **< 3000 ppm (< 0.3%wt)**

TOXICITY IN NUMBERS

Comparison between low dosage Flame Retardant masterbatches like UL94 V2

FR masterbatch	Dosage %wt in PP	Halogen content (ppm)	Halogen content (%wt)	ATO Heavy Metals
Silmaflame AP1770	5% (V2)	0	0	NO
Silmaflame AP2077	2.5% (V2)	< 700	< 0.07%	NO
Silmaflame AP1372	2.5% (V2)	< 1500	< 0.15%	NO
Typical halogenated MB (PE68)	2.5% (V2)	> 8000	> 0.80%	YES

TOXICITY IN NUMBERS

Comparison between high dosage Flame Retardant masterbatches like UL94 V0

FR masterbatch	Dosage %wt in PP	Halogen content (ppm)	Halogen content (%wt)	ATO Heavy Metals
Silmaflame AX1765	30% (V0)	< 900	< 0,09	NO
Silmaflame AP2290	30% (V0)	0	0	NO
Typical halogenated MB (DBDPE/ATO)	30% (V0)	> 140000	> 14	YES

APPLICATIONS





Thanks for your attention