Technical Information No.060E

Developed product : Antimony Tetroxide

Antimony tetroxide is expected to provide high flame retardancy while maintaining the resin's inherent heat resistance and hydrolysis resistance, as it is more heat-resistant than antimony trioxide.

Table 1 Typical physical properties of antimony tetroxide

Chemical formula	Sb_2O_4
Molecular weight	307.52
melting point	1070℃
Appearance	Colorless crystals
Density	6.64 g /cm3
Sparingly soluble solvent	Water, KOHaq, HClaq, Ethanol

Table 2 (Reference data) Physical properties of Sb2O4 prototype

	Sb2O4(%)	As(%)	Pb (%)	Fe(%)	Sb2O3(%)	Particle size (D50, μm)	SSA (m2/g)
Value	99.6	0.002	<0.001	0.002	0.4	0.59	2.70

	Color		
Value	L*	a*	b*
	96.40	0.20	5.20
Method	Color meter		

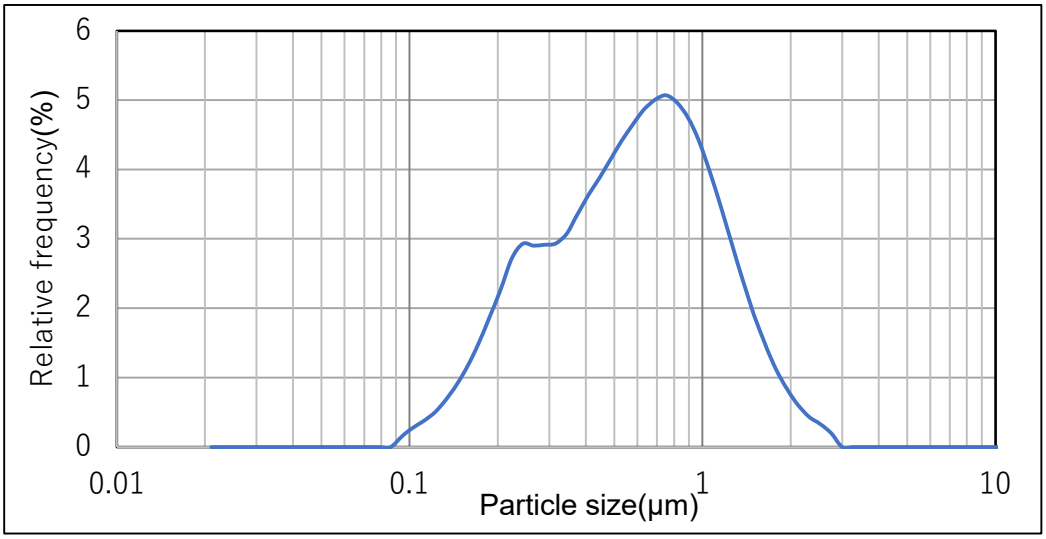


Fig.1 Particle size distribution of Sb2O4 prototype

Flame Retardancy of Antimony Tetroxide

Table 4 shows the flame retardancy when antimony tetroxide, antimony trioxide, and antimony sodium tartrate are blended as flame retardant additives in PBT resin. While the flame retardancy of antimony tetroxide is lower than that of antimony trioxide, it is higher than that of sodium antimonate.

Table 4 Flame retardancy of antimony tetroxide and other antimony compounds

		Sample1 (phr)	Sample2 (phr)	Sample3 (phr)
Resin	PBT	100	100	100
Flame retardant	Brominated epoxy resin	20	20	20
	Antimony tetroxide	6.7	-	-
	Antimony trioxide	-	6.3	-
	Sodium antimonate	-	-	5.1
Flame retardancy	LOI	28.3	31.8	27.2
	UL-94 (0.8mm)	V-2	V-0	V-2

The amount of flame retardant additive is adjusted to achieve a Br:Sb (molar ratio) of 3:1, which is considered to provide the most effective flame retardancy (sodium antimonate, 5:1).

Properties of antimony tetroxide compounded resin

Table 5 shows properties of resin that compounded antimony tetroxide, antimony trioxide, and sodium antimonate.There is little difference in resin strength depending on the type of antimony compound, but PBT resin blended with antimony tetroxide has a slightly yellowish tint compared to antimony trioxide, resulting in a color similar to that of sodium antimonate.

Table 5 properties of resin that compounded Antimony compounds

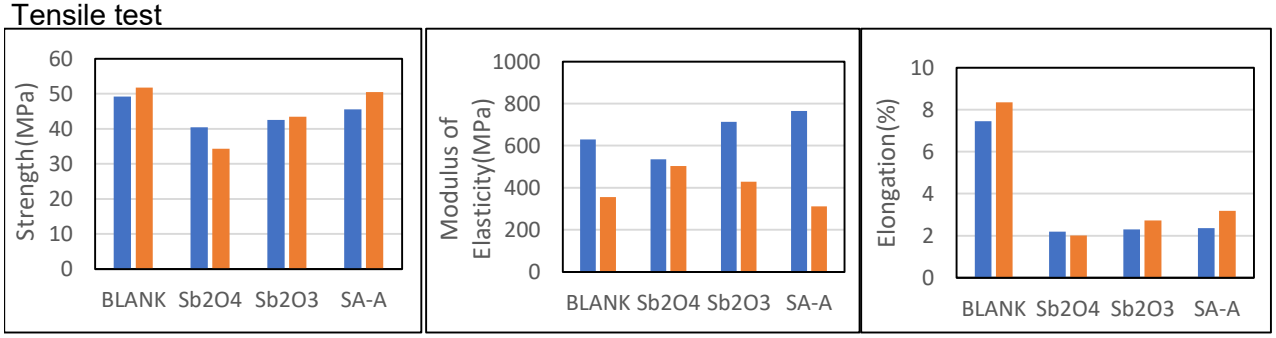
Flame retardant		Sb2O4	Sb2O3	NaSbO3
Tensile test	Strength(MPa)	40	43	46
	Modulus of Elasticity(MPa)	535	714	766
	Elongation(%)	2.2	2.3	2.4
Bend test	Strength(MPa)	72	71	76
	Flexural Modulus(MPa)	1650	1707	1708
IZOD impact strength(J/m)		24.0	22.4	22.8
MFR(g/10min、230℃、2kgf)		27.4	27.2	27.3
Color	*L	89.7	93.2	89.5
	*a	0.8	-0.1	-0.5
	*b	8.3	5.2	7.3

*Each resin formulation is the same as Samples 1 to 3 in Table 4.

Hydrolysis resistance of antimony tetroxide compounded resin

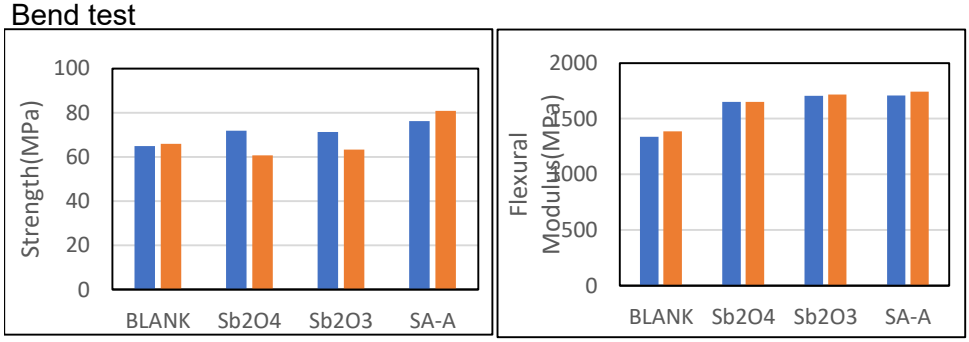
We evaluated various resin properties of PBT resin compounded with antimony tetroxide, antimony trioxide,and sodium antimonate before and after high-temperature and high-humidity treatment (96 hours of static exposure in an environment the changes in resin properties before and after the high-temperature and high-humidity treatment. with a temperature of 80°C and humidity of 80%). The graph below illustrates resin physical properties before and after the treatment.

Tensile test



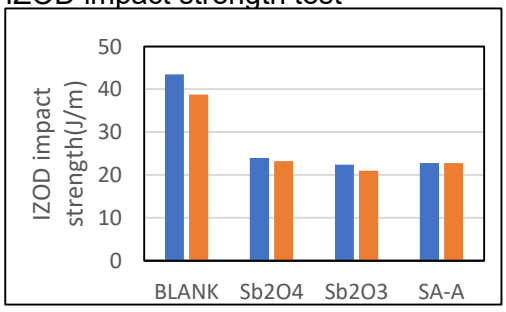
Blue: before the treatment, Orange: After the treatment

Bend test



Blue: before the treatment, Orange: After the treatment

IZOD impact strength test



Blue: before the treatment, Orange: After the treatment

For details regarding our product under development, please feel free to consult our sales representatives.

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