Flame retardancy of Sodium Antimonate “SA-A”

Sodium antimonate “SA-A” as high heat-resistance flame retardant has been employed in engineering plastics such as polyamide or polyester to improve their higher performance.

SA-A, pentavalent antimonate, provides engineering plastics with flame retardance without adversely affecting the material features of the original plastics and SA-A keeps original heat and hydrolysis resistance of the plastics.

Although high water content (adhesive and crystal water) and coarse particle size which are existing features of sodium antimonite cause hydrolysis and bad dispersibility, SA-A is being produced as non-water and fine type under our tight quality control.

The refractive index of this grade is close to those of plastics, thus SA-A keeps original transparency and clear coloring of the plastics better than antimony trioxide.

Standard Assay

Table 1 SA-A Typical data

English name	Sodium Antimonate
Chemical formula	$NaSbO_3$
CASNo.	15432-85-6
Appearance	White powder
Bulk specific gravity(g/cm^3)	0.6
$NaSbO_3$ (%)	98.4
As (%)	0.03
Pb (%)	0.01

*Typical data is not guaranteed data but observed data

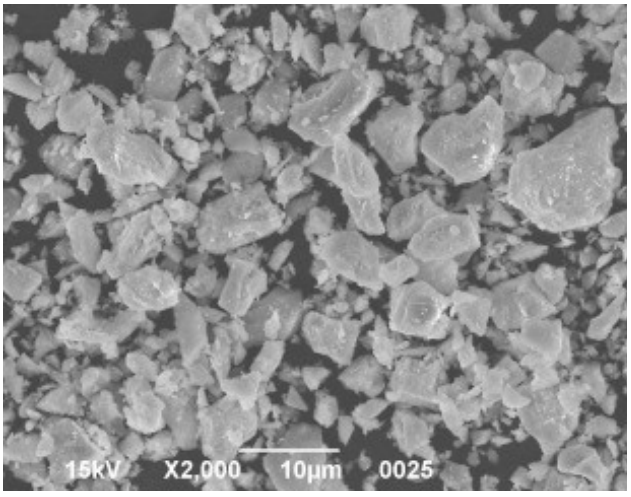

Fig.1 SA-A SEM Photograph

Refractive Index

The refractive index of this grade is close to those of plastics, thus SA-A keeps original transparency and clear coloring of the plastics better than antimony trioxide.

Table.2 Refractive index

Chemical name	Refractive index
Sodium Antimonate SA-A	1.73
Antimony Trioxide PATOX-M (Standard Grade)	2.08

Thermal Stability

Sodium antimonate does not have melting point, and it is stable until decomposition at 1400℃. Therefore SA-A is being applied to engineering plastics which require high temperature process.

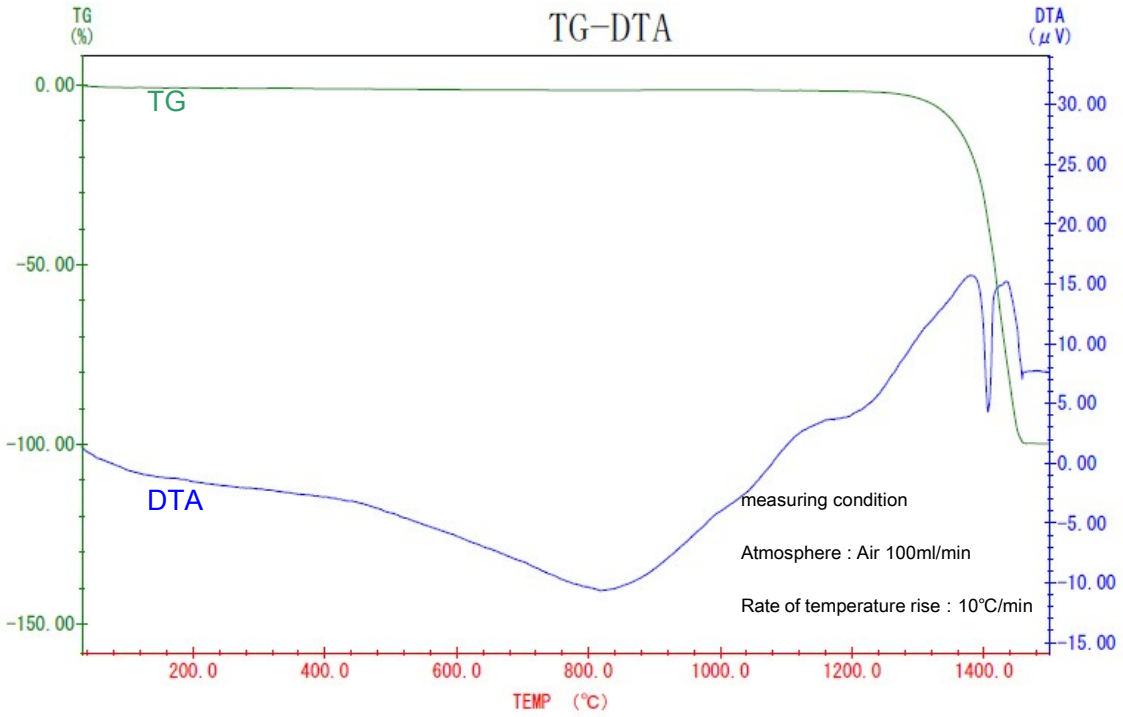

Fig. 2 Thermal behavior of Sodium Antimonate SA-A

Particle Size Distribution

SA-A is fine-grained for cutting coarse particle and shows good dispersibility, so is not ruined plastics strength. We also have other grade “SA-AF” as finer grade.

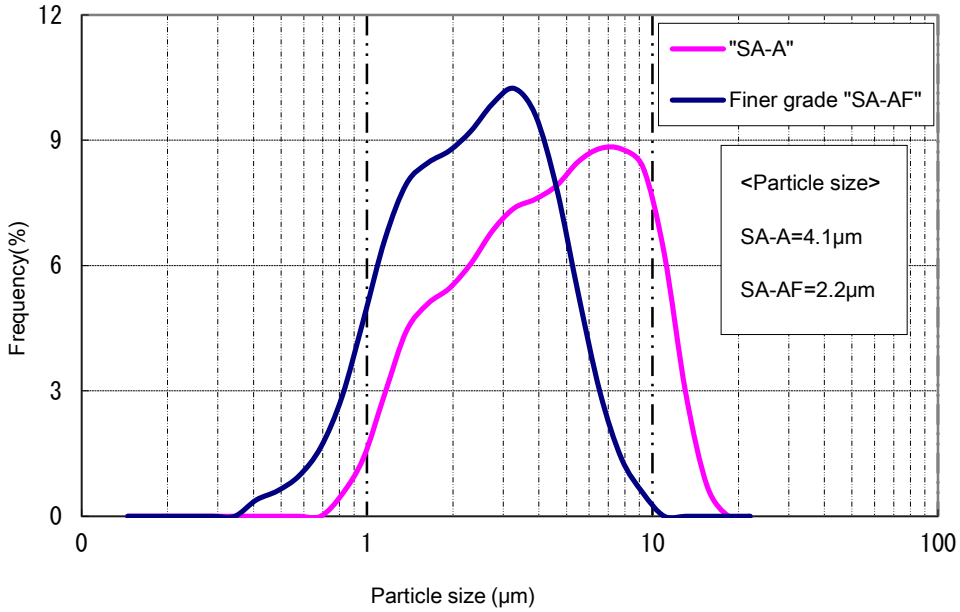

Fig. 3 Particle size distribution data

*Typical data is not guaranteed data but observed data

Flame Retardant Property

Sodium Antimonate which is pentavalent antimonite, shows effective flame retardance by combining with halogen flame retardant. (Antimony 1 : Halogen 5　by mole ratio)

Table.3　Examples of Sodium Antimonate mixture

Type of Polymers (Phr)		Flame retardant Typical Date (Phr)				LOI (%)	UL-94 (0.8mm)
GF-PET (GF 30%)	100	Br-PS (Br 68w%)	15	SA-A	5.0	30.5	V-0
	100		20		6.7	34.6	V-0
	100		25		8.3	38.6	V-0
	100		30		10.0	40.8	V-0

*LOI：Compliance “JIS K 7201”.

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Moisture Absorbency

Generally antimonate has moisture absorbency and sodium antimonate “SA-A” also has same characteristic (Fig. 4). To prevent the moisture, SA-A is wrapped with the high dampproof bag (Fig. 5). After opening the bag, please avoid the moisture to keep the quality of product.

【 SA-A moisture absorption test】

SA-A (powder, completely dehydrated) →

Exposed in the high humidity atmosphere (45 and 75% humidity)

→ moisture percentage measurement

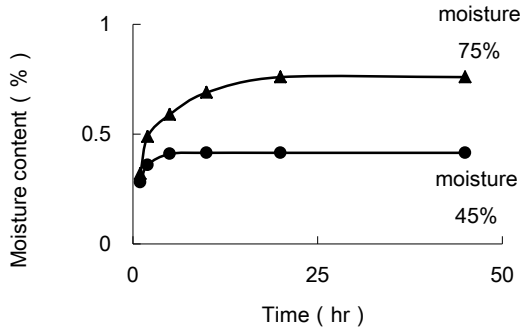

Fig.4 SA-A moisture absorption test

【SA-A (packaged) moisture absorption test】

Every sample for measurement (Karl Fischer method) is picked from unopened packages of single lot.

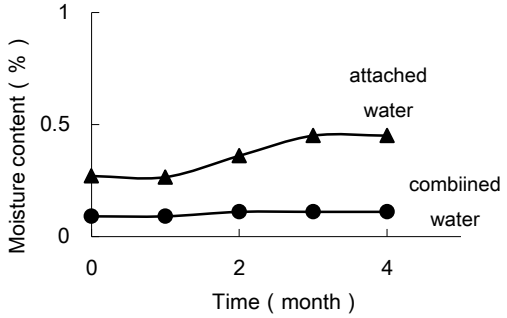

Fig.5 SA-A (packaged) moisture absorption test

Plastics Strength Feature

Antimony trioxide widely used as flame retardant and also used as catalyst of the PET resin. In some case, engineering plastics depolymerize due to catalyst action of antimony trioxide. But SA-A which is pentavalent antimonate provides engineering plastics flame retardance without deterioration of plastic features such as heat and hydrolysis resistance. As shown in Tab. 6, the resin which is compounded with sodium antimonite SA-A has higher strength than that of with antimony trioxide. Also the resin shows higher physical strength than that of with antimony trioxide under hot-humid atmosphere.

【Comparative testing on resin strength and heat and hydrolysis resistance】

PET resin kneading → Test pieces → Exposure test in hot-humid atmosphere → Resin strength measurements

Table.4 Resin composition

Sample name	Resin	Flame retardant	
SA-A compounded resin	PET(GF30%) 100Phr	Br-PS 25Phr	SA-A 8.3Phr
Sb2O3 compounded resin	PET(GF30%) 100Phr	Br-PS 25Phr	Sb2O3 10.4Phr

Table.5 Atmosphere test

Conditions	
Temp	80℃
Moisture	100%RH

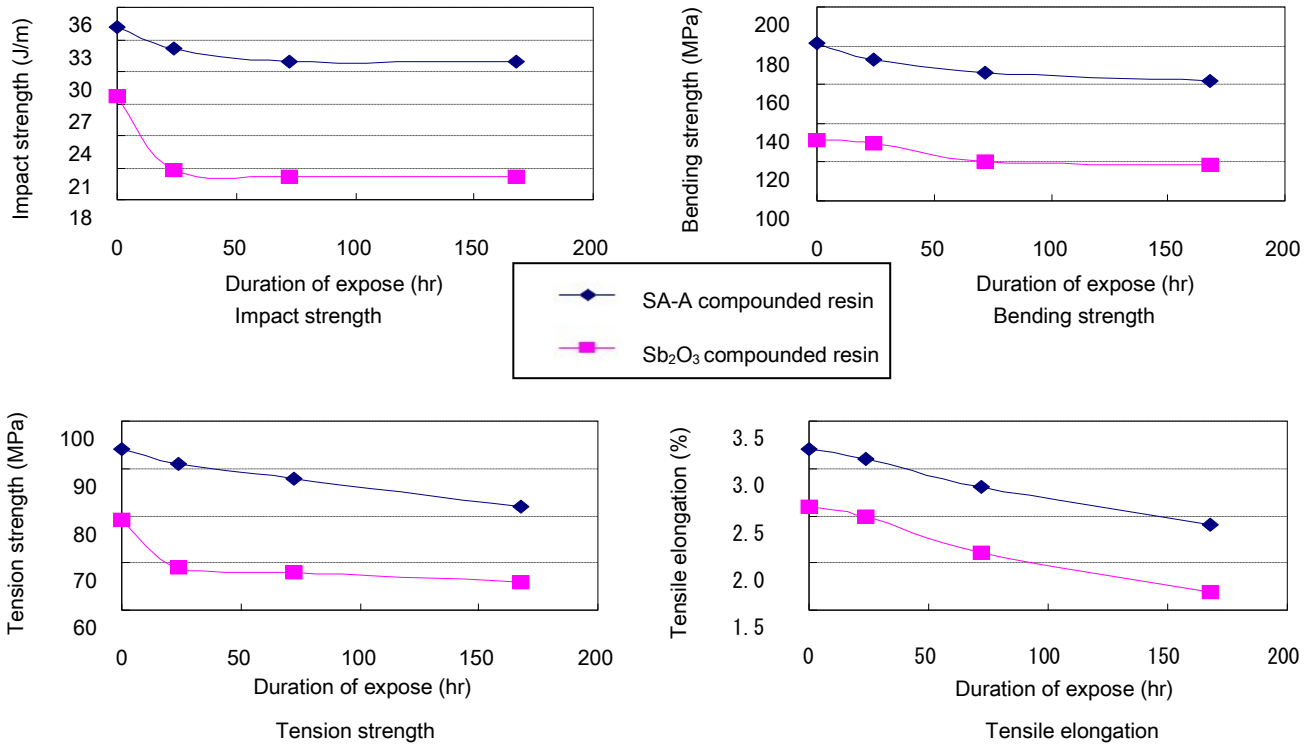

Fig.6 Strength tests of resins

*Impact strength : Compliance “ASTMD256”, Tension strength & Tensile elongation : Compliance “JIS K 7113” ,ending elongation : Compliance “JIS K 7171”

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Head Office 3-2 Shimomiyabi-cho, Shinjuku-ku, Tokyo 162-0822, Japan
TEL 81-3-3235-0021 81-3-3235-0031 (Sales Department) FAX 81-3-3235-0034

Osaka Branch Daido Seimei South Building, 1-2-11 Edobori, Nishi-ku, Osaka 550-0002, Japan
TEL 81-6-7711-0120 FAX 81-6-7711-0121

Nakase Refinery 1198 Yoshii, Yabu-shi, Hyogo 667-1111, Japan
TEL 81-79-667-2121 FAX 81-79-663-5000

http://www.nihonseiko.co.jp