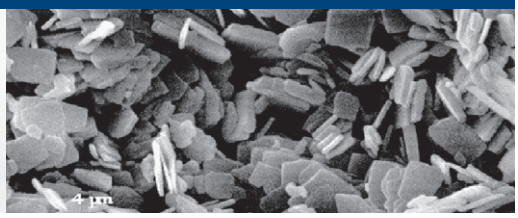


SIBELCO
SPECIALTY MINERALS EUROPE

Portaflame® SG (ATH)

Optimizing viscosity in highly filled FR resins

Sibelco produces a broad range of flame retardant & smoke suppressant fillers based on aluminium hydroxide (ATH), natural magnesium hydroxide, natural hydrated calcium borate and hydrated magnesium calcium carbonate.

Recently, Sibelco extended their range of synthetic ATH products with complementary granulometries, making it possible to mix coarse and fine products and optimizing viscosity of highly filled resinous systems, e.g. SMC, BMC, epoxies and PUR. This can be achieved by preparing ATH product with high packing density by mixing coarse product with steep granulometry and fine product with broad granulometry in the right ratio. The overview of ATH portfolio of Sibelco and their basic properties is given in Table 1.

The effect of mixing ratio of ATH products with different granulometries on the oil absorption (OA) is given in Figure 1. It follows from Figure 1 that the packing density and thus the OA is very dependent on the mixing ratio as well as on the relative difference of the particle sizes of the two components in the mixture. Apparently, larger difference of the average particle sizes (D_{50}) of the two components results in the higher packing density of the mixture with the optimum at the ratio of 8 - 10. To check the applicability of this approach to the resin systems, viscosity of polyester resin (PES) filled with 150 phr of ATH mixtures were measured.

The results of the viscosity and OA measurements of the mixture of **Portaflame® SG100** with **Portaflame® SG20** and **Portaflame® SG10** are given in Figure 2 and 3, respectively.

Figure 1

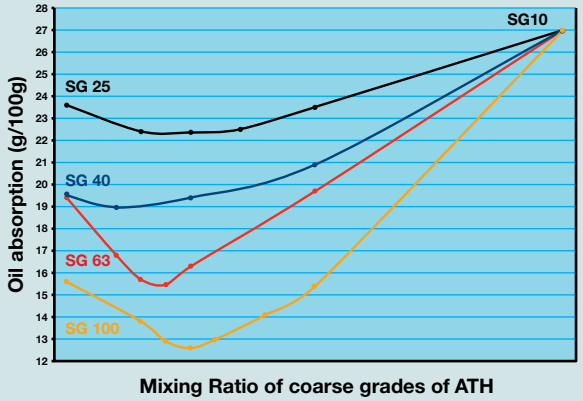


Figure 2

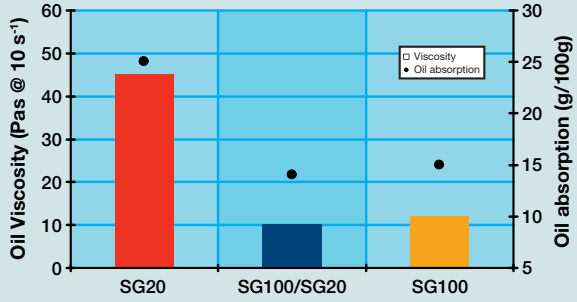


Figure 2a

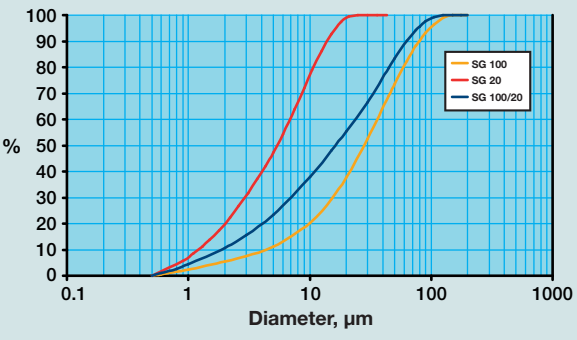


Figure 3

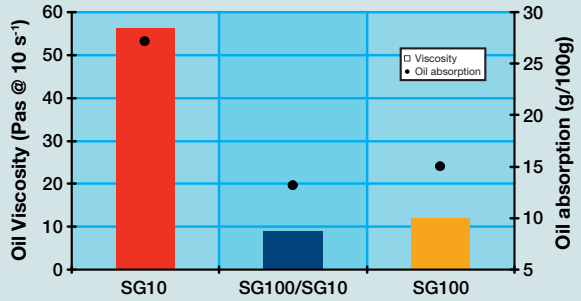
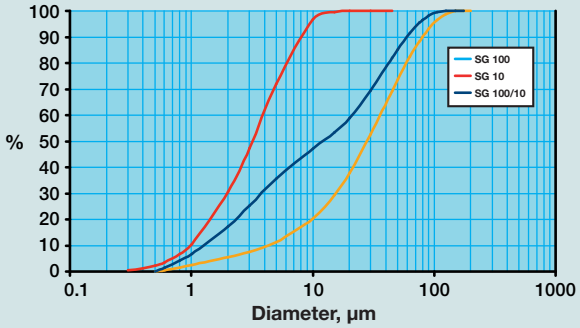


Figure 3a



It is clear that the minimum oil absorption gives a good indication of the minimum viscosity in the polyester resin. Adding of certain quantity of **Portaflame® SG10** or **SG20** to **Portaflame® SG100**, results in decrease of both, oil absorption and viscosity in PES. The viscosity of the combination of **Portaflame® SG100** with **SG10** is only about 10% lower that the combination with **SG20**.

The latter combination is cost wise more attractive for application where the top grain of **SG100** is acceptable. However, in the applications where **SG100** is too coarse (good surface appearance, potting compounds, etc.), **Portaflame® SG10** is needed to obtain low viscosity when combined, for example, with finer **Portaflame® SG63**. The basic properties of different mixtures of Sibelco's ATH are summarized in Table 2.

Portaflame type	Particle size distribution type	D_{10} (µm)	D_{50} (µm)	D_{90} (µm)	D_{97} (µm)	> 45 µm (%)	BET (m^2/g)	OA (g/100g)	Viscositeit in PES @ 150 phr (Pas)
SG10	Broader particle size distribution	0.9	2.7	7	10	0	7	27	56
SG20		1.3	5.5	14	18	0	5	25	45
SG25		1.5	8.5	21	28	0	4	24	28
SG40		1.6	11.5	31	39	0.1	2.5	20	17
SG50		1.7	13	33	42	0.5	2	20	20
SG35	Steeper particle size distribution	2.2	14.5	31	39	0	2	25	36
SG55		3	20	41	50	1	1	21	21
SG63		3	22	47	60	5	0.7	19	17
SG100		5	33	80	110	38	0.5	15	12

Tabel 1 Basic properties of ATH portfolio from Sibelco

Portaflame type	Particle size distribution type	D_{10} (µm)	D_{50} (µm)	D_{90} (µm)	D_{97} (µm)	> 45 µm (%)	BET (m^2/g)	OA (g/100g)	Viscositeit in PES @ 150 phr (Pas)
SG35/SG10	Bimodal particle size distribution	1.5	8.5	28	36	0	3.5	21	25
SG40/SG10		1.4	8.3	29	38	0	3.2	19	14
SG55/SG10		1.7	12	36	43	0.8	2.2	17	13
SG63/SG10		1.7	13	40	50	4	2	15	12
SG100/SG10		1.3	14	60	83	30	1.8	13	9
SG55/SG20		2	16	41	52	0.8	1.8	18	17
SG63/SG20		2	16	42	54	4	1.6	17	16
SG100/SG20		2	17	62	86	30	1.4	14	10

Tabel 2 Basic properties of mixtures made from ATH of Sibelco

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