LAMP BLACK 101
LAMP BLACK 101 BEADS

Technical Information 1477

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1. Manufacturing process

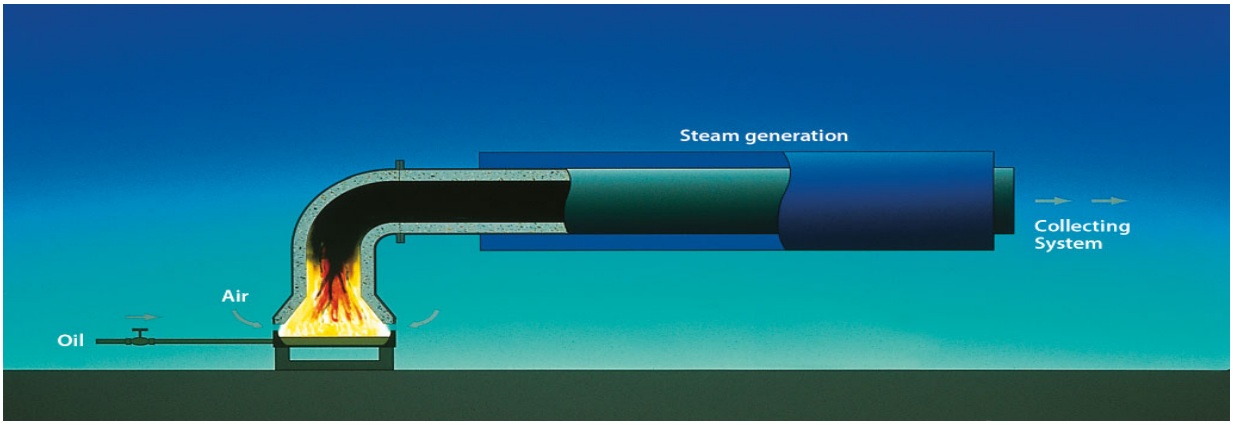


Figure 1: Scheme of the lamp black production process

The oldest method of manufacturing carbon black is the lamp black process (figure 1).
The liquid raw material, or possible melted raw material, is placed in a cast iron dish and ignited. It initially burns when air is admitted to a fireproof refractory hood, which is heated by the hot gas. The radiation heat from the hood evaporates the raw material and pyrolysis begins in the gaseous phase. After cooling the resulting carbon black pigment is separated from the process gas flow with the aid of filters. Pigment development under these unique conditions creates a characteristic, wide distribution of primary particles, is relatively coarse and has a medium structure. This can be seen in figure 2 and 3.

A single lamp black aggregate is shown in figure 3.

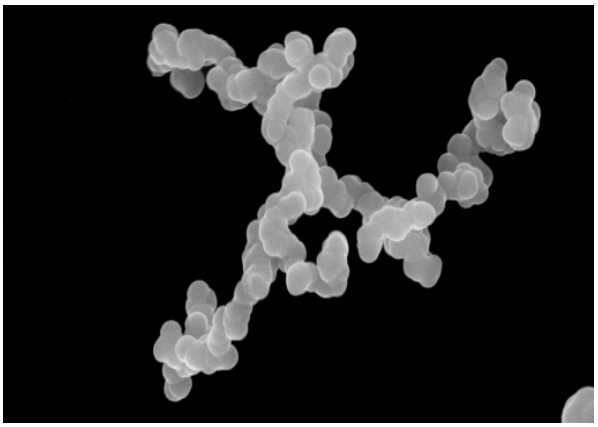
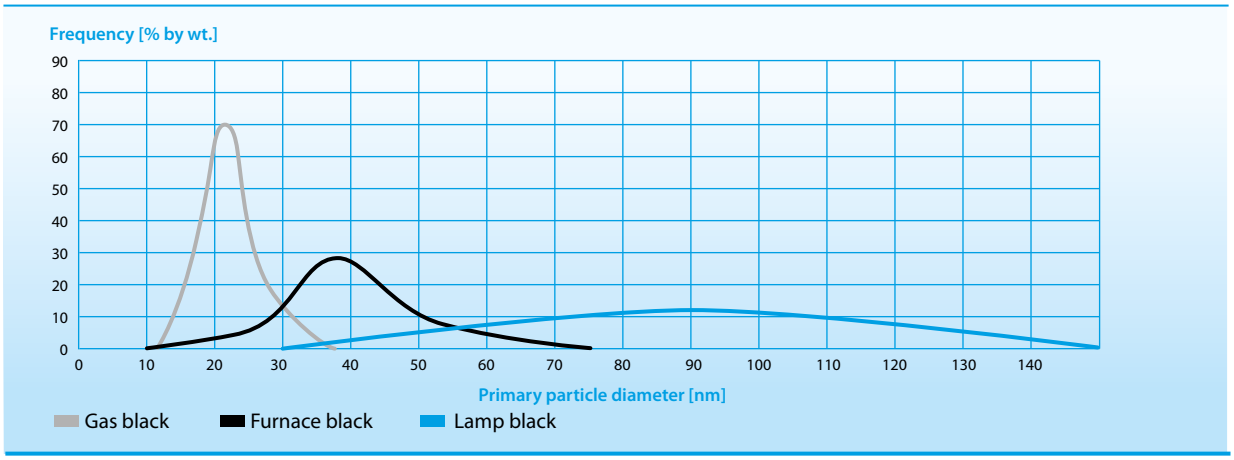


Figure 3: LAMP BLACK 101 aggregate, FESEM (Field-Emission Scanning Electronic Microscope) image (magnification 50,000 times)



2. Product properties

A major factor that determines the coloristic properties of carbon black pigments is the mean primary particle size which is usually within the nanometer range. The terms primary particle, aggregate and agglomerate are explained in DIN 53 206 and figure 4.

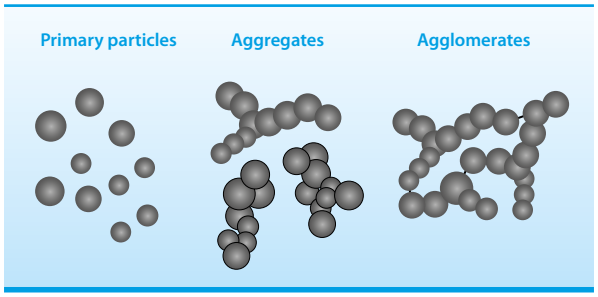


Figure 4: Particle definition in accordance with DIN 53 206 (2)

3. Physico-chemical properties

Verification of mean primary particle size is performed by evaluating transmission electron microscope (TEM) images, which can be conducted with semi-automatic or fully automatic analyzers. Depending on the method of evaluation and the software being used results are obtained which vary slightly. The primary particle size published by Orion Engineered Carbons are normally determined with a semi-automatic particle size analyzer TGZ3 made by Carl Zeiss.

Combining different sizes and numbers of primary particle in the aggregate creates a spectrum of different aggregate sizes which, in turn, is characteristic of this product and leads to specific application properties.

Figure 5 and 6 show examples of different aggregates and different particle sizes in aggregates.

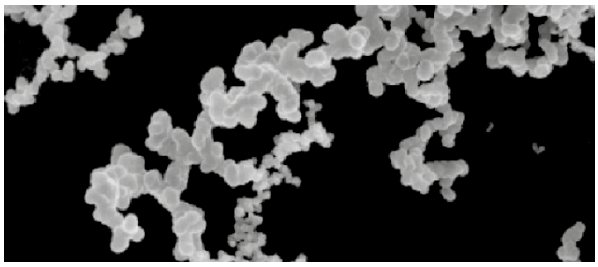


Figure 5: Different aggregates of LAMP BLACK 101, FESEM image (magnification 10,000 times)

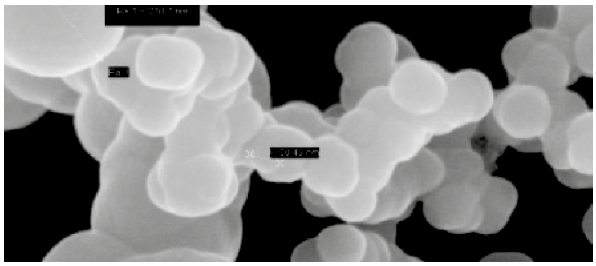


Figure 6: Different primary particle pizes in LAMP BLACK 101 aggregates, FESEM image (magnification 100,000 times)

	LAMP BLACK 101	LAMP BLACK 101 BEADS
Average primary particle size Following internal method TGZ3	95 nm	95 nm
Ash content Following ASTM D 1506	0.02 %	0.5 %
pH value Following ISO 787-9	8	8
BET surface area Following ASTM D 6556	29 m2 / g	29 m2 / g
Toluene extract Following ISO 6209	< 0.1 %	< 0.1 %
Volatile matter at 105°C Following ISO 787-2	< 1 %	< 1 %
Volatile matter at 950°C Following DIN 53552	0.7 %	0.7 %
Sieve residue 45 µm Following ISO 787-18	< 100 ppm	< 100 ppm

Table 1 Summarizes typical values for selected properties of LAMP BLACK 101

4. Coloristic properties of LAMP BLACK 101

LAMP BLACK 101 is mainly used as a tinting agent in liquid paint systems, powder coating systems and plastics. In pure color applications a brownish undertone is found due to primary particle size and aggregate size, while in gray coloration a rather bluish undertone is often observed. For comparison purpose figure 7 shows the jetness value M_Y following DIN 55979 and the relative tint strength following ASTM D 3265 (IRB 3 = 100%) for several tinting pigment blacks.

The low color intensity of LAMP BLACK 101 creates an advantage in use. Relatively minor metering errors in production, for example, are not as critical as in the case of products with a higher tinting strength.

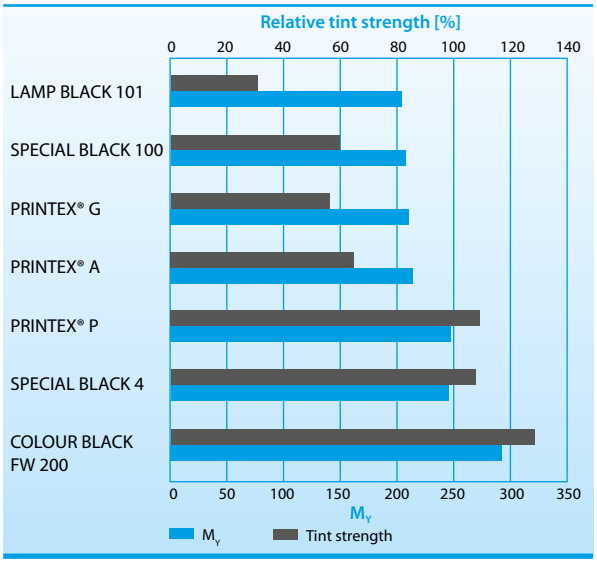


Figure 7: Jetness value and relative tint strength

5. Purity of LAMP BLACK 101

Table 2 below shows typical trace impurity levels detected in LAMP BLACK 101 single samples taken at random. The values in table 2 are not part of the product specification but may be useful for reference.

Trace elements	LAMP BLACK 101	LAMP BLACK 101 BEADS
AL	< 5 ppm	< 5 ppm
B	< 2 ppm	< 3 ppm
Ba	< 1 ppm	< 5 ppm
Ca	3 ppm	160 ppm
Cr	< 5 ppm	< 5 ppm
Cu	< 1 ppm	< 1 ppm
Fe	20 ppm	12 ppm
K	< 10 ppm	< 20 ppm
Mg	< 5 ppm	30 ppm
Na	< 20 ppm	700 ppm
S	0.3 %	0.5 %
Si	< 20 ppm	< 13 ppm
W	< 2 ppm	< 5 ppm

Table 2: Trace impurities in LAMP BLACK 101 types

6. Application effects

Coloring

LAMP BLACK 101 serves as pigment in full tone and more commonly tinting applications.The relatively coarse primary particle distribution makes LAMP BLACK 101 an optimal choice for coloring mineral systems (concrete, mortar etc.) with minimized weathering effects.

Reactive component

The high purity and excellent reactivity make LAMP BLACK 101 the first choice if a carbon source is needed as reactive component, like in formulating carbides and forming carbon brushes.

Thermal insulation

LAMP BLACK 101 has an excellent thermal conductivity and IR absorption capability. This makes it the first choice in EPS panels to improve thermal insulation performance.

Used in the manufacturing process of refractory materials LAMP BLACK 101 helps to reduce the porosity of the finished product. Also the reductive effect of LAMP BLACK 101 helps to improve the penetration ability of the finished product against liquid metals and hot gases, increasing the lifetime and ability to withstand higher temperatures.

In casting powder formulations LAMP BLACK 101 provides multiple functions. For example, the excellent thermal conductivity helps to control and decrease the chill rate of the casting metals.

Conductivity

LAMP BLACK 101 with its high purity and unique broad particle size distribution for easy processing functions as a conductive carbon additive in standard and advanced lead-acid batteries to improve the performance of those systems.

7. Packaging

	Paper bag	Pallet	FIBC
LAMP BLACK 101 POWDER	25 kg	600 kg	475 kg / 2.4 m^3
LAMP BLACK 101 BEADS	25 kg	1000 kg	850 kg / 2.4 m^3

Table 3

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