FDA conformity of specialty carbon blacks for polymer systems

Technical Information 1217

orion ENGINEERED CARBONS

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Orion Engineered Carbons GmbH is one of the world's largest manufacturer of carbon blacks and has a decade's working experience in this product group.

Carbon blacks are products for industrial-scale applications. Manufactured under tightly controlled process conditions, they are subject to constant quality control. Carbon is the main ingredient of specialty carbon blacks, sometimes with small amounts of hydrogen, oxygen and sulfur in the form of functional groups. Depending on the manufacturing process used, specialty carbon blacks contain traces of Polycyclic Aromatic Hydrocarbons (PAH), which are strongly bound to the surface due to the powerful adsorption capabilities of these blacks. In the 21 Code of Federal Regulations, Section 178.3297, which refers to blacks (CAS 1333-86-4), the Food and Drug Administration has set limits for the total amount of selected PAHs and Benzo(a)pyrene in materials that come into direct contact with food.

The amount of the PAHs listed in figure 1 must not exceed a total amount of 0.5 ppm; the amount of Benzo(a)pyrene must not exceed 5 ppb.

PAHs are removed from the carbon black surface by means of a 48-hour toluene extraction carried out at boiling temperature. Gas chromatography is used in conjunction with a mass spectrometer (GC/MS) to identify and quantify PAHs. The analytic values are determined by an independent testing institute accredited in accordance with DIN EN 45001.

Figure 1

Naphthalene	Chrysene
Acenaphthylene	Benzo(b/j)fluoranthene
Acenaphthene	Benzo(k/j)fluoranthene
Fluorene	Benzo(e)pyrene
Phenanthrene	Benzo(a)pyrene
Anthracene	Perylene
Fluoranthene	Dibenz(ac/ah)anthracene
Pyrene	Benzo(ghi)perylene
Benzo(ghi)fluoranthene	Indeno(1.2.3-cd)pyrene
Benz(a)anthracene	Anthantrene
Cyclopenta(cd)pyrene	Coronene

Moreover, the non-migration principle in accordance with 21 CFR Section 170.39, still applies. In this case, it must be shown with the appropriate tests involving food simulants that no polyaromatics can migrate from the packaging material into the food. This method involves a very extensive test procedure that is to be carried out only in accordance with the FDA recommendations and guidelines.

Orion Engineered Carbons GmbH offers several specialty carbon black grades, which meet the requirements of the 21 CFR Section 178.3297:

- **PRINTEX® F alpha**
- **PRINTEX® F P**
- **PRINTEX® F 80**
- **PRINTEX® F 85**
- **AROSPERSE® F 138**
- **HIBLACK® F890B**

These four specialty carbon blacks are high-purity furnace blacks.

The maximum concentration of specialty carbon blacks in articles intended to come into contact with food must not exceed 2.5 % by weight.

The specialty carbon blacks PRINTEX® F P and PRINTEX® F alpha fall in the category of regular color furnace blacks. They can be used for UV protection and pigmenting in polymers and coatings. PRINTEX® F alpha is characterized by superior dispersibility, processability and an improved compound moisture adsorption value.

PRINTEX® F 80 and PRINTEX® F 85 give polymers a deep black color. Both specialty carbon blacks are so-called medium color furnace blacks.

When used in full-color pigmentation, PRINTEX® F 85 BEADS produces a blue-tinged undertone apart from a high color depth. In master batches, this specialty carbon black provides for a high filler content – a feature remarkable for this product group – and excellent rheology.

Whereas PRINTEX® F 80, in direct contrast to PRINTEX® F 85, exhibits more favorable dispersibility and a somewhat lower color depth due to its higher structure (see table OAN adsorption).

PRINTEX® F P, PRINTEX® F alpha, PRINTEX® F 80, and PRINTEX® F 85 are supplied in beads. PRINTEX® F 80 is also available as a powder specialty carbon black.

AROSPERSE® F 138 is a regular color furnace blacks that can be used for coloring polymers and coatings. It's key attributes include excellent dispersibility and imparts a consistent color with blue undertone in all polymer substrates.

HIBLACK® F 809B belongs to the group of high color furnace blacks and is characterized by two main properties. It gives a very deep black and a high tinting strength to polymers. HIBLACK® F 809B is therefore especially suitable for engineered and crystalline polymers like Polypropylene and Acrylonitrile-Styrene-Acrylate.

Table 1

	PRINTEX® F P	PRINTEX® F alpha	PRINTEX® F 80	PRINTEX® F 85	AROSPERSE® F 138	HIBLACK® F890B
Specialty carbon black type	RCF	RCF	MCF	MCF	RCF	HCF
Average primary particle size [nm]	20	20	16	16	19	15
OAN [ml/100 g]	102	100	105	54	95	90
BET Surface area [m^2/g]	120	105	225	200	120	270

The above mentioned specialty carbon blacks are obtainable only in bags.

List of abbreviations

BET	Brunauer Emmett Teller (Surface area method)
OAN	Oil absorption number
HCF	High color furnace
MCF	Medium color furnace
RCF	Regular color furnace
PAH	Polycyclic Aromatic Hydrocarbon

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