

Blackening for the highest requirements

New AF-Carbon® black masterbatches



Carbon black is typically used for black coloration of PA polyamides 6 and 6.6. High grade carbon black masterbatches are used in order to ensure intensive and reliable results of direct coloring of compounds. However, carbon black, as the coloring matter, is used to its limits in a few application cases with great demand from the technical or aesthetical aspect. Soluble dyes clearly prove to be advantageous here. They are not coated with the polyamide matrix as in case of pigment particles, but directly color the matrix deep-black.

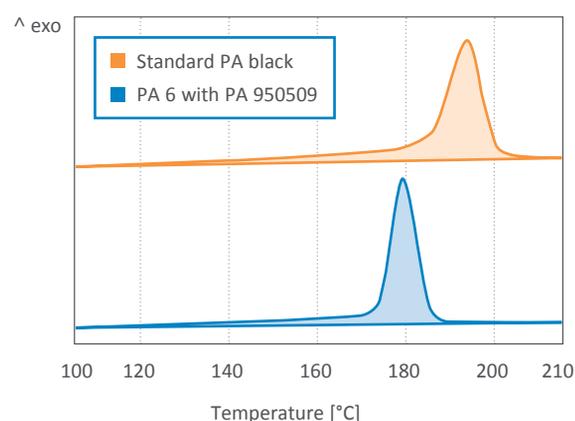
The benefits of dyes in polyamide are reaped especially with the coloring agent nigrosine (Solvent Black 7). The positive influence of **AF-Carbon® PA 950509 black** in terms of rheological and mechanical properties is accomplished with a special quality of raw material. It also facilitates production of deep-black products having clearly better surfaces and high luster in compounds which are glass fibre reinforced or flame protected. The influence of useful properties such as impact strength, strength and elasticity stays minimal.

AF-Carbon® PA 950509 black similarly improves the processing properties. Nigrosine is soluble in polyamide and does not result in increase in viscosity as in case of carbon black. It facilitates a better mould filling. The special formulation of **AF Carbon® PA 950509 black** makes open a vast expanse of the processing window. This is achieved by reducing the recrystallisation temperature from 12-17 Kelvin, both in PA 6 and PA 6.6 (see Tab. 2). In addition to an improved moldability, clearly improved results are achieved in gas- or water-internal pressure applications (GID, WID) and even in foam injection moulding processes. A new element here is that this effect is achieved both in PA 6 as well as PA 6.6 (see Tab. 2).



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Influence of recrystallisation temperature of PA 6 (Fig. 1)



	PA 6 /GF 30	PA 6 /GF 30	PA 6 /GF 30
Coloring matter	PA 950089 black (carbon black)	PA 950509 black	Standard Nigrosin Batch
Recrystallisation	193 °C	176 °C	179 °C

Tab. 1: Effect of nigrosine on recrystallisation temperature of PA 6 / GF 30

	PA 6.6 /GF 30	PA 6.6 /GF 30	PA 6.6 /GF 30
Coloring matter	PA 950089 black (carbon black)	PA 950509 black	Standard Nigrosin Batch
Recrystallisation	236 °C	225 °C	238 °C

Tab. 2: Conventional nigrosine master batch does not indicate any effect on recrystallisation of PA 6.6 unlike on PA 950509 black.

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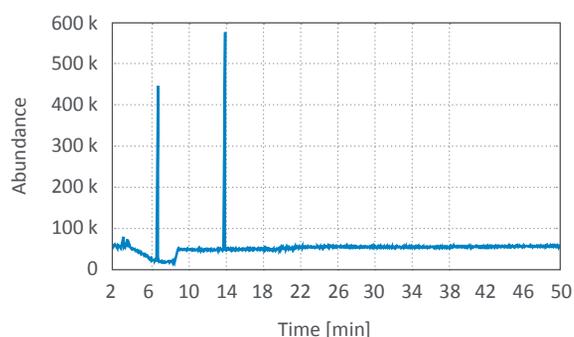
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Emission

Very strict requirements were set with regard emission, particularly in the automobile sector. **AF-Carbon® PA 950509 black** based on very pure and low polluting raw materials. Emission behaviour was compared in various studies based on VDA 278. PA 6.6 compounds, which were colored using **AF-Carbon® PA 950509 black**, exhibited a VOC value that was almost 25x less as compared to compounds which were produced using the conventional nigrosine master batch.

Chromatogram of VOC determination (Fig. 2)



PA 6.6 / GF 30

Coloring matter	PA 950089 black (carbon black)	PA 950509 black	Standard Nigrosin Batch
VOC [$\mu\text{g C/g}$]	7	2	48

Tab. 3: VOC values of different PA 6.6 Compounds based on VDA 278 [threshold value depending on OEM < 30 - 50 mg C/g]



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UV Stability

Nigrosine is an organic coloring agent and has a light- and weather-resistant property, which is clearly inferior to coloring using high grade pigment carbon black. This void is filled by **AF-Carbon® PA 950532 black**. Durable protection against UV radiation is possible in an extremely high grade carbon black. At the same time, an deep-black color with all advantages of the coloring agent can be achieved for processing by adding some amount of nigrosine.



Fig. 3: PA6 GF30 plates, colored with PA 950532 black as compared to a standard nigrosine black according to 500 h QUV tester [ASTM G 154 C1].

Summary

As compared to the carbon black masterbatches, nigrosine coloring agent masterbatches facilitate blackening with least possible influence on the useful properties of the finished product. High degree of gloss, deeper black tones and better surface qualities are achieved specially in filled polyamide compounds.

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