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Information letter: Chlorine-containing colourants/pigments in masterbatches/colour concentrates

Information about chlorine/halogen-containing colourants/pigments:

Depending on their formulations, colourant preparations can contain organic pigments which constitutionally – i.e. because of their chemical structures – contain chemically bound chlorine.

Some of these pigments are well-established standard pigments, which – due to their outstanding technical properties – have been used for a very long time in masterbatches/colour concentrates for the colouring of plastic articles. Manufacturers within Masterbatch Verband assume responsibility and use pigments from reputable suppliers.

In order to ensure specific properties of finished articles, numerous organic pigments on the market contain chlorine as part of their chemical composition. In other words: they contain chlorine, which is chemically (covalently) bonded as part of their molecular structure. This also applies for certain organic pigments intended for food contact. The presence of chlorine improves the overall properties of these pigments. For example, resistance to light, weathering and heat improves whilst solubility in organic solvents and water is reduced. Data measured in tests using food simulants show lower solubility – which also means a lower likelihood of migration from food packaging materials to foodstuffs.

Contents of chlorine in chlorine-containing pigments vary considerably, ranging from 5 percent to ca. 50 percent. It was noted that the presence even of high amounts of organically bound chlorine does not impair the safety of pigments to humans and the environment.

The absence of toxicity and ecotoxicity can be explained by looking at two pigments with higher contents of organically bound chlorine (as "worst case" scenario), namely C.I. Pigment Green 7 (chlorine content: ca. 50 percent) and C.I. Pigment Yellow 110 (chlorine content: ca. 45 percent). These pigments display neither acute toxicity nor acute ecotoxicity, and they show no mutagenic properties in the Ames test. In total, two subchronic 90-day studies in rats and mice were performed with C.I. Pigment Green 7 and did not result in any toxic effect. Furthermore, both pigments are listed by the US Food and Drug Administration (FDA, 21 CFR 178.3297); they are also included in the French positive list.

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The discussion about risks and benefits of chlorine-containing products is increasingly shifting to an emotional level – probably because the possibility cannot be ruled out of their presence in waste streams causing toxic gases in waste incineration. In line with the commitment under the global Responsible Care initiative and wishing to obtain a more precise picture of a possible formation of dibenzodioxins and dibenzofurans in the incineration process, ETAD (The Ecological and Toxicological Association of Dyes and Organic Pigment Manufacturers) mandated pertinent laboratory studies. Conditions in municipal waste incineration plants were modelled in these studies, with tests being performed in pigment powder and not in coloured finished articles. The pigment powder contained a share of ca. 50 percent of organically bound chlorine. With state-of-the-art analysis techniques, data measured even in this "worst case" scenario – i.e. incineration of undiluted pigment – were only just above the usual detection limits.

Pigments for food packaging meet strict legal requirements (such as e.g. FDA, AP(89) 1, BfR Recommendation no. IX).

In terms of food law, the respective declarations of conformity apply for the supplied colourants and colour concentrates.

Absence of chlorine:

Colour concentrates/masterbatches, which contain pigments from which bound chlorine is constitutionally absent, can still have traces of chlorine compounds. For this reason, we cannot confirm total absence of chlorine; such information might be unreliable.

Beilstein test:

The Beilstein test provides non-specific proof of halogens/chlorine, i.e. this is a purely qualitative method which does not enable any findings regarding sources of thus detected halogens/chlorine. Quite often, the Beilstein test is performed simply as a preliminary test in studies of plastic materials (first indication of PVC).

A positive Beilstein test does not substantiate the presence of toxic chlorine/halogen compounds; this positive result only points to a substance/mixture which contains chemically bound chlorine/halogens.

This can be highlighted by two examples:

- Common salt reacts positively in the Beilstein test. In almost all regions throughout Germany, the Beilstein test results in positive detection in pure drinking water from the tap.
- Proof is not certain, because some volatile nitrogen compounds, too, can colour the flame green. This is stated in relevant elementary literature and in textbooks.

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Conclusion:

A substitution of chlorine-containing pigments brings no further advantages for the safety of environment and health.

In many cases, substituting a chlorine-containing pigment with a constitutionally chlorine-free pigment – with the aim of maintaining the colour shade or the same technical properties – is very difficult or not possible at all.

Masterbatch Verband
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Association of Dyes and Organic
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