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Nano particles in Food Contact Material (FCM) are save !

The use of pigments and fillers

Pigments and fillers are found in all articles of modern living, which would be inconceivable without these substances. They have technical, decorative, protective and safety-related functions.

Pigments and fillers are used for the colouring and surface structuring of nearly all products found in our daily life. They consist of small particles which are mostly insoluble and firmly bound in the application medium (e.g. paints, coatings, inks and plastics).

Pigments and fillers have not been "invented" just recently under nanotechnology promotion programs; they have been used for centuries and are the result of industrial research from the past one hundred years.

Pigments and filler in food contact materials (FCM)

Pigments and fillers are frequently used in plastics, coatings, and printing inks in contact with food. Here, it must be distinguished between direct food contact (food contact side toward the FCM) and indirect food contact (Food Contact side away from the food). In both cases, it must be ensured that there is no migration into the foodstuff.

If the EU Commission's Recommendation 2022/C 229/01 on the definition of nanomaterials[1] is applied to pigments and fillers, the majority of traditional pigments and fillers are likely to be classified as nanomaterials and included in the statistics on nanomaterials. The question of whether nanoparticles can migrate from plastics or printing inks into foodstuffs has been under discussion for many years. The results of the studies carried out both by the pigment and filler industry and by the user industry are described in the following.

Studies on the release of nanomaterials from paints, printing inks, coatings, and plastics

The following studies show that no free nanoparticles are released from from organic and inorganic pigments and fillers firmly embedded in a matrix, even under mechanical stress, e.g. at the cut edge, or during weathering.

Then again, because of the strong tendency to agglomerate known for very small particles and due to the prevailing dispersion conditions in plastics, there are practically no free particles sized 1 to 3 nm in plastic materials. This was also shown by comparative electron microscopy.

In corresponding migration studies from printing inks, no migration of nanoparticles was found either. Since the dried and cured ink film is a polymer matrix that firmly encloses the pigments and fillers it contains, and on the basis of the experimental results, it was concluded that no nanoparticles from printing inks are transferred to food.

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[1] Commission Recommendation 2022/C 229/01 of 10 June 2022 on the definition of nanomaterials, eur-lex.europa.eu/legal content/EN/TXT/PDF/?uri=CELEX:32022H0614(01)

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Migration studies on zinc oxide (nanoform, with and without surface post-treatment) in plastic have shown that no migration of nanoparticles takes place here either.

The studies and additional theoretical considerations[2+3] demonstrate that a particle migration can be excluded for particles with a size of more than 2 or 3 nm.

Studies:

- Study 1: Very small carbon black particles (ca. 16 nm) in plastics
- Study 2: Very small carbon black particles (ca. 16 nm) in a rubber matrix (EPDM)
- Study 3: Printing inks with organic pigments, titanium dioxide and aluminium metal pigment
- Study 4: Printing inks with organic and inorganic pigments and titanium dioxide in polymer (styrene acrylic copolymer)
- Study 5: Pigments (titanium dioxide, yellow iron oxide, carbon black) and fillers (synthetic amorphous silica, kaolinite and muscovite) in different lacquer matrices for the use as can coatings), silica and for can coating
- Study 6: Tin nano particles in low density polyethylene (LDPE)
- Study 7: Silver, clay, titanium dioxide, carbon black and silica in various polymer matrix
- Study 8: Metal-organic nanopigments in polypropylene (PP)

1) Migration of nanoparticles from plastic packaging materials containing carbon black into foodstuffs

Johannes Bott, Angela Störmer, Roland Franz, *Food Addit Contam Part A Chem Anal Control Expo Risk Assess.* **2014**, *31*(10),1769-82, https://doi.org/10.1080/19440049.2014.952786

2) Investigations into the Potential Abrasive Release of Nanomaterials due to Material Stress Conditions-Part A: Carbon Black Nano-Particulates in Plastic and Rubber Composites

Johannes Bott and Roland Franz, Departement of Product Safety and Analytics, Fraunhofer Institute for Process Engineering and Packaging (IVV), 85354 Freising, Germany https://doi.org/10.3390/app9020214 ; https://www.mdpi.com/2076-3417/9/2/214

3) Nanoscale pigment particles: Analysis of the migration behaviour form printing ink layers of printed food packaging into food

Dr. Matthias Henker Flint Group Germany GmbH, Dr Sarah-Lisa Theisen Siegwerk Druckfarben AG & Co. KGaA, Dr Michael Becker ECKART GmbH, Dr. Marting Schleß German Paint and Printing Ink Association (VdL) DLR_nanoscale_pigment_particles.pdf (eupia.org);

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[2] *Migration potential of nanomaterials in food contact plastics*, Angela Störmer, Johannes Bott & Roland Franz, *1st Joint Sympo sium on Nanotechnology, Fraunhofer* – BfR, Berlin**, 5.-6. March 2015**

[3] *A model study into the migration potential of nanoparticles from plastics nanocomposites for food contact*, Angela Störmer, Johannes Bott & Roland Franz, *Food Packaging and Shelf Life 2(2) 73-80* **(2014)**

4) Nanoscale pigment particles: Investigation on the migration of nanoscale pigment particles from printing ink layers to food during transient direct contact

Dr. Matthias Henker, Martin Schleß, Frank Lange, Inga Buschaue, Christof Walter, Dirk Lange und Lutz Becker 2020-02-DLR- Nanoscale pigment particles.pdf (eupia.org)

5) VdMi research project „Investigations into the release and and transfer of nanomaterials used as pigments and fillers from can coatings into food“

Food Packaging and Shelf Life 16 (2018), 112–121, Johannes Bott, Angela Störmer, Peter Albers, Fraunhofer Freising Investigation into the release of nanomaterials from can coatings into food – ScienceDirect

6) A model study into the migration potential of nanoparticles from plastics nanocomposites for food contact

Angela Störmer, Johannes Bott & Roland Franz, *Food Packaging and Shelf Life 2(2) 73-80 FCM Substance No 87* (= Silicon dioxide, silanated) A model study into the migration potential of nanoparticles from plastics nanocomposites for food contact - ScienceDirect

7) Critical review of the migration potential of nanoparticles in food contact plastics

A. Störmer, J. Bott, D. Kemmer, R. Franz, *Trends in Food Science & Technology* Critical review of the migration potential of nanoparticles in food contact plastics - ScienceDirect

8) Investigating ion-release from nanocomposites in food simulant solutions: Case studies contrasting kaolin, $CaCO_3$ and Cu-phthalocyanine

Zhen Zhang, Oliver Kappenstein, Ingo Ebner, Emmanuel Ruggiero, Philipp Müller, Andreas Luch, Wendel Wohlleben, Andreas Haase, *Food Packaging and Shelf Life 26, 100560 (2020)* *Investigating ion-release from nanocomposites in food simulant solutions: Case studies contrasting kaolin, CaCO3 and Cu-phthalocyanine - ScienceDirect*

Findings of the studies :

- No migration of organic and inorganic pigments and fillers
- No migration of printing inks with pigments (organic and inorganic) and filler
- No migration of carbon black

Conclusion

It is noted that nanoparticles cannot migrate from the food contact material into foodstuffs.

A particle migration can be excluded for particles with a size of more than 2 or 3 nm

Nano is safe in FCM, Nano is a size information, not a risk information.

Thus, it does not make sense to cover these tightly incorporated pigments and fillers in the context of nano in FCM.

Thus, we do not see any basis for special restrictions on nanomaterials in FCM by the legislator here either.

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For greater transparency, it would help to educate customer and consumers that a nanomaterial is not generally associated with a higher risk.

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About Eurocolour:

Eurocolour represents European manufacturers of pigments, dyes, fillers, and ceramic colours and glazes. It brings together around 100 companies – approximately 75% of which are SMEs – with a combined annual turnover of €5.7 billion. The sector accounts for one-third of global production and directly employs over 18,000 people across Europe.