General Properties

Chemical Structure: Cr/Sb/Ti-oxide
Colour Index Part I: P.Br. 24
Colour Index Part II: 77310
CAS Number: 68186-90-3
Physical Form: Fine Granules
Colour Shade: Yellow

Preparations

(Other) preparations can be made on special request.

Colouristical Properties Org.

<table>
<thead>
<tr>
<th>Hue Grade in PVC 1/9 SD</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chroma in PVC 1/9 SD</td>
<td>-</td>
</tr>
<tr>
<td>Red. Ratio in PVC 1/9 SD</td>
<td>-</td>
</tr>
<tr>
<td>Hue Grade in PVC 1/25 SD</td>
<td>77.4</td>
</tr>
<tr>
<td>Chroma in PVC 1/25 SD</td>
<td>29.1</td>
</tr>
<tr>
<td>Red. Ratio in PVC 1/25 SD</td>
<td>4.7</td>
</tr>
</tbody>
</table>

Hue Grade in PE-LD 1/9 SD: -
Chroma in PE-LD 1/9 SD: -
Red. Ratio in PE-LD 1/9 SD: -

Ease of Dispersion: <10

Physical Properties

<table>
<thead>
<tr>
<th>Density</th>
<th>4.4 g/cm³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk Density</td>
<td>0.8 g/cm³</td>
</tr>
<tr>
<td>Index of pH</td>
<td>7-8</td>
</tr>
<tr>
<td>Conductivity</td>
<td>150 μS/cm</td>
</tr>
<tr>
<td>Specific Surface</td>
<td>3 m²/g</td>
</tr>
</tbody>
</table>

Fastness properties

Heat stability: 320 °C
Light fastness: 8
Weather fastness: 5
Migration fastness: 5

Infl. on warping of PE-HD: No

Fastness to chemicals:
- HCl conc. >6 Months
- HCl 10% >6 Months
- H2SO4 conc. >6 Months
- H2SO4 10% >6 Months
- HNO3 conc. 3 Months
SICOTAN® YELLOW K 2111 FG

HNO₃ 10% >6 Months
NaOH conc. >6 Months
Na₂CO₃ sat. >6 Months

Criteria for the fastness to chemicals was a possible colour change of the coloured plastic material during the storage in the test medium.

Recommendations for applications

<table>
<thead>
<tr>
<th>Material</th>
<th>Suitability</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC-p</td>
<td>Suitable</td>
</tr>
<tr>
<td>PVC-u</td>
<td>Suitable</td>
</tr>
<tr>
<td>PUR</td>
<td>Suitable</td>
</tr>
<tr>
<td>LD-PE</td>
<td>Suitable</td>
</tr>
<tr>
<td>HD-PE</td>
<td>Suitable</td>
</tr>
<tr>
<td>PP</td>
<td>Suitable</td>
</tr>
<tr>
<td>PS</td>
<td>Suitable</td>
</tr>
<tr>
<td>SB</td>
<td>Suitable</td>
</tr>
<tr>
<td>SAN</td>
<td>Suitable</td>
</tr>
<tr>
<td>ABS/ASA</td>
<td>Suitable</td>
</tr>
<tr>
<td>PMMA</td>
<td>Suitable</td>
</tr>
<tr>
<td>PC</td>
<td>Suitable</td>
</tr>
<tr>
<td>PA</td>
<td>Suitable</td>
</tr>
<tr>
<td>PETP</td>
<td>Suitable</td>
</tr>
<tr>
<td>CA/CAB</td>
<td>Suitable</td>
</tr>
<tr>
<td>UP</td>
<td>Suitable</td>
</tr>
</tbody>
</table>

UCC: Under certain conditions

Recommendations for food applications

<table>
<thead>
<tr>
<th>Agency</th>
<th>Suitability</th>
</tr>
</thead>
<tbody>
<tr>
<td>BgVV</td>
<td>Suitable</td>
</tr>
<tr>
<td>FDA</td>
<td>Suitable</td>
</tr>
<tr>
<td>France</td>
<td>Suitable</td>
</tr>
</tbody>
</table>

UCC: Under certain conditions

All data is subject to the producer’s disclaimer
Product Specification - SICOTAN® YELLOW K 2111 FG

**PROPERTIES**
- **Pigment type:** Cr/Sb/Ti-oxide
- **Colour Index:** Pigment Brown 24
- **Application:** Colourant for plastics
- **Physical form:** Fine Granules
- **Storage:** practically unlimited shelf life
- **Food packaging:** approved according to "Empfehlung IX des BgVV".

**SPECIFICATION**
- **Colour tolerances:** \(dH^* \pm 0.7; dC^* \pm 0.7;\)
- **Strength equivalence:** 100 ± 5 %
- **Test method:** BASF test method 11.3.3.3

Please note:
The above data will be warranted by us. These data, however, as well as the properties of any product samples do not imply any legally binding assurance of certain properties or of suitability for a specific purpose so that any liability for damages cannot be derived therefrom.
Microscopy - SICOTAN® YELLOW K 2111 FG
Heat Stability
SICOTAN® YELLOW K 2111 FG

Test medium:
PE-HD (Lupolen 6031M)

According to
DIN 53772

Note: The program stores curve points (see table). The diagram shows approximations.
Particle Size Distribution
SICOTAN® YELLOW K 2111 FG

Note: The program stores curve points (see table). The diagram shows approximations.
Reflection Curve
SICOTAN® YELLOW K 2111 FG

Note: The program stores curve points (see table). The diagram shows approximations.

Test medium:
PVC-p
Weather fastness
SICOTAN® YELLOW K 2111 FG

Test medium:
PE-HD (Lupolen 6031M)
According to
DIN 53387, 54001

Steps grey scale
1%
1:4
1:20

Hours

0 1 2 3 4 5

0 500 1000 2000 3000 5000
Light fastness
SICOTAN® YELLOW K 2111 FG

Test medium:
PE-HD (Lupolen 6031M)

According to
DIN 53387, 54004

Steps blue wool scale

0 2 4 6 8

1% 1:4 1:20
Name of product  SICOTAN® Yellow K 2001/2010/2011/2107/2109/2111/2112 including the FG products

C.I. No. / Name  77 310 / C.I. Pigment Brown 24, Chrome Titanium Yellow (Ti,Sb,Cr)O2
CAS No.  68186-90-3
EINECS No.  269-052-1

Chemical nature  Practically insoluble rutile pigments based on chromium(III)/antimony(V)/titanium dioxide. Chromium-III-oxide, the chromatic component, and antimony pentoxide, for balancing the valency, are absorbed by the rutile lattice of these products. The heavy metal oxides thus lose their chemical, physical, and physiological properties. The toxicological and ecological properties therefore correspond largely to those of titanium dioxide rutile. The acid-soluble antimony content is less than 20 mg/kg. These doped rutile pigments must not be regarded as antimony compounds which must be labelled as dangerous substances.

Toxicology  In experiments on animals, chrome titanium yellow pigments did not display acute toxicity. Feeding tests on rats to determine the chronic toxicity revealed no toxicological finding whatever. No acute irritant effect was shown in tests to determine the acute irritation of the skin and mucous membranes. Extreme exposure to dust may lead to a brief irritation of the eyes by mechanical influence.

Ecology  The chrome titanium yellow pigments do not represent any hazard for the environment owing to their inert, practically insoluble character. They can be removed mechanically from effluents. If they are dumped on a controlled dumping site, dissolved heavy metals are not given off to the seepage water. If articles coloured with chrome titanium yellow pigments are incinerated, they are recovered in the original form in the residual ash.

Water hazard class  WGK 0 (generally non water hazardous according to German legislation - self-classification)

Labelling  Chrome titanium yellow pigments are not dangerous substances in the sense of the German Ordinance on Dangerous Substances or of corresponding EU regulations.

Classification as dangerous goods  The products are not classified as hazardous under transport regulations.

MAK value  The general threshold value for dust, i.e. 6 mg/m³, must be observed. (Proposal of the MAK commission for the alveolar passing dust fraction, i.e. 1.5 mg/m³, is not yet valid) (Germany)

Heavy metal content  The SICOTAN® pigments listed contain 3-4 % of chromium(III) and 1011 % of antimony. The products do not contain any lead, cadmium, chromium(VI) and mercury compounds in their formulations. The sum of the total contents of these elements, according to tests on standard samples, is less than 100 mg/kg. It is thus below the limit in the EU packaging directives and the American CONEG model. The hexavalent chromium content is below the
limit of detectability, i.e. 1 mg/kg. The average values for the total contents of technically unavoidable impurities are as follows:

<table>
<thead>
<tr>
<th>Element</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>30 mg/kg</td>
</tr>
<tr>
<td>Lead</td>
<td>50 mg/kg</td>
</tr>
<tr>
<td>Cadmium</td>
<td>&lt; 10 mg/kg</td>
</tr>
<tr>
<td>Cobalt</td>
<td>&lt; 10 mg/kg</td>
</tr>
<tr>
<td>Copper</td>
<td>&lt; 10 mg/kg</td>
</tr>
<tr>
<td>Nickel</td>
<td>&lt; 50 mg/kg</td>
</tr>
<tr>
<td>Selenium</td>
<td>&lt; 1 mg/kg</td>
</tr>
<tr>
<td>Mercury</td>
<td>&lt; 1 mg/kg</td>
</tr>
<tr>
<td>Zinc</td>
<td>&lt; 100 mg/kg</td>
</tr>
</tbody>
</table>

**Halogen content**

The SICOTAN® pigments do not contain any halogens in their formulations.

**Food legislation**

According to tests on standard samples (Type 8081) the SICOTAN® pigments listed conform to the demands on purity in the following food legislation (see also “Heavy metal content”):

- **Europe:** Resolution AP (89)
- **Germany:** BgVV Empfehlung IX., 190. Mitteilung vom 1.6.1994
- **France:** Brochure No. 1227
- **Italy:** Decreto Ministeriale dated 21.3.1973
- **Spain:** Resolución del 4.11.82 de la Subsecretaría de Sanidad
- **USA:** FDA approved to § 170.39 for each polymer up to 2%. In approval for 21.CFR, § 178.3297.

They feature absolute fastness to migration in the coloration of plastics in contact with food. Extraction tests with chrome titanium yellow as 1 % colorant in eight different plastics were carried out. The extraction conditions were 10 days at 40 °C with 4 food simulants, distilled water, 3 % acetic acid, 10 % alcohol, and Test Fat HB 307. Even when the limits of detectability were very low, i.e. 0.2 µg/l of chromium and 0.25 µg/l of antimony, no detectable migration was determined in the extraction experiments.

**Toys**

According to tests on standard samples (Type 8082), the SICOTAN® pigments listed conform to the demands on purity in the European standard on toys, i.e. EN 71, Part 3.

**Registration status**

The products are listed in the chemical inventories of the following countries: EU (EINECS), USA (TSCA), Canada (DSL), Japan (MITI), Australia (AICS), Korea (ECL), Philippines (PICCS, Final Version 1995), and Switzerland (BAGT No. 691990, Class free).

**Other legislation on chemicals**

The products do not fall under the provisions of the agreement on chemical weapons and do not contain any substances that are mentioned in the German Ordinance on the Prohibition of Certain Chemicals (ChemVerbotsV). They are produced without using substances that destroy ozone (Montreal Agreement - Ozone Depleting Substances).

**TA Luft**

Para 3.1.4, Class III (chromium, antimony) (Germany)

Further information can be found in our Material Safety Data Sheets, Technical Information Bulletins and in the Product Safety Info No. 4 "Discussion on heavy metals contained in pigments" and No. 5 "Toxicological and ecological data about nickel and chromium titanium yellow pigments (SICOTAN) and data for food contact application". The Product Safety Department in our Inorganic Pigments Division will gladly reply to your queries and can be reached under the
following address:

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The information submitted in this publication is based on our current knowledge and experience. It is the responsibility of those to whom we supply our products to ensure that any proprietary rights and existing laws and legislation are observed.