General Properties

Chemical Structure: Mn/Sb/Ti-oxide
Colour Index Part I: P.Y. 164
Colour Index Part II: 77899
CAS Number: 68412-38-4
Physical Form: Powder
Colour Shade: Brown

Preparations

(Other) preparations can be made on special request.

Colouristical Properties Org.

Hue Grade in PVC 1/9 SD: 50.6
Chroma in PVC 1/9 SD: 18.8
Red. Ratio in PVC 1/9 SD: 0.85

Hue Grade in PVC 1/25 SD: 51.8
Chroma in PVC 1/25 SD: 13.9
Red. Ratio in PVC 1/25 SD: 2.84

Hue Grade in PE-LD 1/9 SD: 47.5
Chroma in PE-LD 1/9 SD: 19.2
Red. Ratio in PE-LD 1/9 SD: 0.8

Ease of Dispersion: <10

Physical Properties

Density: 4.3 g/cm³
Bulk Density: 0.9 g/cm³
Index of pH: 7
Conductivity: 330 µS/cm
Specific Surface: 3 m²/g

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

All data is subject to the producer's disclaimer
SICOTAN® BROWN K 2611

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>Suitable</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC-p</td>
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</tr>
<tr>
<td>PVC-u</td>
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</tr>
<tr>
<td>PUR</td>
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</tr>
<tr>
<td>LD-PE</td>
<td></td>
</tr>
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<td>HD-PE</td>
<td></td>
</tr>
<tr>
<td>PP</td>
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<td>PC</td>
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</tr>
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</tr>
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<td>CA/CAB</td>
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<tr>
<td>UP</td>
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</table>

UCC: Under certain conditions

**Recommendations for food applications**

<table>
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<tr>
<th>Approval</th>
<th>Suitable</th>
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</thead>
<tbody>
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<td>BgVV</td>
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<tr>
<td>FDA</td>
<td>UCC</td>
</tr>
<tr>
<td>France</td>
<td>Not suitable</td>
</tr>
</tbody>
</table>

UCC: Under certain conditions

All data is subject to the producer’s disclaimer
Product Specification - SICOTAN® BROWN K 2611

**PROPERTIES**
- **Pigment type:** Mn/Sb/Ti-oxide
- **Colour Index:** Pigment Yellow 164
- **Application:** Colourant for plastics
- **Physical form:** Powder
- **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:** \(100 \pm 8\%\)
- **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® BROWN K 2611
Heat Stability
SICOTAN® BROWN K 2611

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® BROWN K 2611

Note: The program stores curve points (see table). The diagram shows approximations.
Reflection Curve
SICOTAN® BROWN K 2611

Test medium:
PVC-p

Note: The program stores curve points (see table). The diagram shows approximations.
Weather fastness
SICOTAN® BROWN K 2611

Test medium:
PE-HD (Lupolen 6031M)

According to
DIN 53387, 54001
Light fastness
SICOTAN® BROWN K 2611

Test medium:
PE-HD (Lupolen 6031M)

According to
DIN 53387, 54004
Name of product  
**SICOTAN® Brown K 2611 / K 2711**

C.I. No. / Name  
77 899 / C.I. Pigment Yellow 164, Manganese Titanium Brown, (Ti,Sb,Mn)O₂

CAS No.  
68412-38-4

EINECS No.  
270-185-2

Chemical nature  
Practically insoluble rutile pigments based on manganese(II)/antimony(V)/titanium dioxide. Manganese-II-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, **SICOTAN® Brown** pigments did not display acute toxicity. No acute irritant effect was shown in tests to determine the acute irritation of the skin and mucous membranes. Feeding tests on rats with the chemically similar nickel and chromium titanium yellow pigments to determine the chronic toxicity revealed no toxicological finding whatever. It can be assumed that also the manganese titanium brown pigments are practically not bio-available. Extreme exposure to dust may lead to a brief irritation of the eyes by mechanical influence. No sensitizing effects have been reported, even after handling **SICOTAN® Brown** pigments for many years.

Ecology  
The **SICOTAN® Brown** 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 **SICOTAN® Brown** pigments are incinerated, they are recovered in the original form in the residual ash.

Labelling  
Manganese titanium brown 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.

Heavy metal content  
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 average values for the total contents of technically unavoidable impurities are as follows:

<table>
<thead>
<tr>
<th>Element</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>30 mg/kg</td>
</tr>
<tr>
<td>Nickel</td>
<td>50 mg/kg</td>
</tr>
</tbody>
</table>
Lead  60 mg/kg  Copper  < 20 mg/kg
Cadmium  < 10 mg/kg  Selenium  < 1 mg/kg
Chromium  < 50 mg/kg  Mercury  < 1 mg/kg
Cobalt  < 10 mg/kg  Zinc  < 100 mg/kg

**SICOTAN®** Brown K 2611 contains constitutionally 3 % of manganese and 5,5 % of antimony; Brown K 2711 contains constitutionally 10 % of manganese and 16 % of antimony.

### Halogen content
The **SICOTAN®** Brown pigments do not contain any halogens in their formulations.

### Food legislation
According to tests on standard samples (Type 8081) the **SICOTAN®** Brown pigments listed conform to the demands on purity in the following food legislation (see also "Heavy metal contents"):

- **Europe:** Resolution AP (89) I
- **Germany:** BgVV Empfehlung IX., 190. Mitteilung vom 1.6.1994
- **France:** Brochure No. 1227 (not listed on the Positive List)
- **Italy:** Decreto Ministeriale dated 21.3.1973
- **Spain:** Resolución del 4.11.82 de la Subsecretaría de Sanidad
- **USA:** Use only on evidence of "non migration".

They feature absolute fastness to migration in the coloration of plastics in contact with food. Extraction tests with manganese titanium brown pigments as 1 % colorant in 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. 1 µg/l of manganese 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®** Brown 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. 691900, 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).

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

### 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)

### TA Luft
Para 3.1.4, Class III (manganese, 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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Mrs Schwarz  
Tel. ++49

Mr Haid  
Tel. ++49

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.