

# POTASSIUM ALUMINIUM SILICATE-BASED PEARLESCENT PIGMENTS, Type III

*Prepared at the 77<sup>th</sup> JECFA (2013), published in FAO Monographs 14 (2013), replacing the tentative specifications prepared for potassium aluminium silicate-based pearlescent pigments prepared at the 74<sup>th</sup> JECFA (2011), published in FAO Monographs 11 (2011). A PTWI of 2 mg/kg bw for total aluminium was established at the 74<sup>th</sup> JECFA (2011). The PTWI applies to all aluminium compounds in food, including food additives. ADIs of 'not limited' for titanium dioxide and 0-0.5 mg/kg bw for iron oxides were established at the 13<sup>th</sup> JECFA (1969) and 53<sup>rd</sup> JECFA (1999), respectively.*

## SYNONYMS

Mica-based pearlescent pigments, Type III; INS 176

## DEFINITION

Potassium aluminium silicate-based pearlescent pigments, Type III, are produced by the deposition of titanium and iron salts on potassium aluminium silicate followed by calcination at high temperatures. The resulting pigment consists of potassium aluminium silicate coated with titanium dioxide, iron oxide and, potentially, mixed oxides. The pigments can be produced with a variety of different pearlescent colour effects depending upon particle size and the combination of titanium dioxide and iron oxide deposited on the potassium aluminium silicate. Particles below a size of 100 nm shall not be present.

While values will vary for each individual pearlescent pigment in regards to the amounts of iron oxide, titanium dioxide and potassium aluminium silicate, particle size and pH of an aqueous slurry, general information can be provided for the pigments as a class. When considered together as a class, Type III pigments typically show ranges for iron oxide, titanium dioxide and potassium aluminium silicate in the pigments of 2-12%, 33-52%, and 36-65%, respectively. Similarly, when taken as a class, median particle size typically ranges from 7-25 µm.

## Assay

Titanium dioxide (TiO<sub>2</sub>):  
Iron oxide (Fe<sub>2</sub>O<sub>3</sub>): As labeled  
Potassium aluminium silicate:

## DESCRIPTION

Powder with distinctive sheen.

## FUNCTIONAL USES

Colour

## CHARACTERISTICS

### IDENTIFICATION

#### Solubility (Vol. 4)

Practically insoluble or insoluble in water.

#### Test for Titanium and Iron

Passes test  
See description under TESTS

## PURITY

#### Loss on Drying (Vol. 4)

Not more than 0.5% (10 g sample, 105°, 2 h)

<u>Impurities soluble in 0.5 M hydrochloric acid</u>	Antimony:	Not more than 3 mg/kg
	Arsenic:	Not more than 3 mg/kg
	Barium:	Not more than 25 mg/kg
	Cadmium:	Not more than 1 mg/kg
	Chromium:	Not more than 100 mg/kg
	Copper:	Not more than 25 mg/kg
	Lead:	Not more than 4 mg/kg
	Mercury:	Not more than 1 mg/kg
	Nickel:	Not more than 50 mg/kg
	Zinc:	Not more than 25 mg/kg
	See description under TESTS	

## TESTS

### IDENTIFICATION TESTS

Tests for Titanium and Iron Use the test solution as shown under method of assay. Analyze titanium and iron in the test solution by ICP-AES technique (Volume 4). Set instrument parameters as specified by the instrument manufacturer, use the analytical lines for Ti (334.941 nm) and Fe (259.940 nm).

### PURITY TESTS

Impurities soluble in 0.5 M hydrochloric acid Extract 20 g of finely ground sample under reflux conditions (to prevent loss of mercury) with 100 ml of 0.5 M hydrochloric acid (spectroscopic grade) for 30 min. Let solution cool, then filter through a 0.1 µm membrane filter. Wash the filter twice with hot 0.5 M hydrochloric acid. Combine the filtrate and wash solution in a 200 ml volumetric flask and make up to volume with 0.5 M hydrochloric acid. Particles below a size of 100 nm shall not be present.

Determine arsenic using an AAS (Hydride generation) technique; antimony, barium, chromium, copper, nickel and zinc by an ICP-AES technique; lead and cadmium using an AAS (Electrothermal atomization) technique; and mercury using an AAS (Cold vapour generation) technique. See "Metallic impurities" in the Combined Compendium of Food Additive Specifications (Volume 4).

**METHOD OF ASSAY** Determination of percent titanium, iron and aluminium: Weigh about 0.5 g of the sample to the nearest 0.1 mg, in a platinum or nickel crucible, add 5 g potassium hydroxide and 2 g boric acid, mix and melt completely using a torch burner (alkali fusion) and allow to stand at room temperature. Place the reaction product along with crucible in a 250-ml PTFE beaker, add 150 ml hot deionized water and dissolve residue by agitation. Wash the crucible with a small amount of hot water and add the washings to the beaker. Add 50 ml hydrochloric acid and transfer the contents into a 250-ml volumetric flask. Wash the beaker three times with hot water, transfer the washings to the volumetric flask and make up to volume (Solution A). Prepare the test solution by diluting Solution A with 2% hydrochloric acid solution to get the solution within the linear dynamic range of the analyzer. Analyze aluminium, titanium and iron in the test solution using ICP-AES (Vol. 4). Set instrument parameters as specified by the instrument manufacturer and use the analytical lines for titanium (334.941 nm), iron (259.940 nm) and aluminium (396.152 nm). Determine the concentration (as µg/ml) of titanium, iron and aluminium from the respective standard

curves. Calculate the percentage of titanium dioxide, iron oxide and potassium aluminium silicate using the formulas below:

$$\begin{array}{l} \% \text{ TiO}_2 \text{ (w/w) in Potassium} \\ \text{Aluminium Silicate-Based} \\ \text{Pearlescent Pigments} \end{array} = \frac{1.668 \times C_{\text{Ti}} \times 250 \times \text{DF}}{W \times 10^6}$$

$$\begin{array}{l} \% \text{ Fe}_2\text{O}_3 \text{ (w/w) in Potassium} \\ \text{Aluminium Silicate-Based} \\ \text{Pearlescent Pigments} \end{array} = \frac{1.43 \times C_{\text{Fe}} \times 250 \times \text{DF}}{W \times 10^6}$$

$$\begin{array}{l} \% \text{ Potassium aluminium} \\ \text{silicate (w/w) in Potassium} \\ \text{Aluminium Silicate-Based} \\ \text{Pearlescent Pigments} \end{array} = \frac{4.92 \times C_{\text{Al}} \times 250 \times \text{DF}}{W \times 10^6}$$

Where:

C is Concentration of Ti, Fe or Al in the test solution,  $\mu\text{g/ml}$

DF is Dilution factor (dilution of Solution A to get test solution)

W is Weight of sample, g