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Functional pigments and extenders for special applications —

Part 1: Nanoscale calcium carbonate for sealant application

Pigments et matières de charges fonctionnels pour applications spéciales —

Partie 1: Carbonate de calcium nanométrique pour les enduits

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 256, *Pigments, dyestuffs and extenders*.

ISO 18473 consists of the following parts, under the general title *Functional pigments and extenders for special applications*:

— *Part 1: Nanoscale calcium carbonate for sealant application*

— *Part 2: Nanoscale titanium dioxide for sunscreen application*

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Introduction

Sealants are widely used to prevent the penetration of air, gas, or liquid in many industries including construction, automobile, and electronics. Extenders are essential part of sealant formulation to reduce cost and improve their rheological and mechanical properties. Content of extenders vary significantly and can be as high as 50 % (mass fraction). The most common extender in sealants is calcium carbonate ($CaCO_3$) because it is readily available and comes in various sizes which act as a rheological modifier, a reinforcing agent, and opacifier. Commercial calcium carbonate can be divided into ground calcium carbonate (GCC) and precipitated calcium carbonate (PCC), possesses three crystal structures including calcite, aragonite, and vaterite, and exists in various morphologies such as cubic, spherical, spindle, fibrous, needle-like, etc. Calcium carbonates with calcite crystal structure and cubic or spherical morphology are most widely used in sealant applications.

Nanoscale calcium carbonate (NCC) provides various sealants with improved performance and additional functionalities including thixotropy, flame resistance and improved durability and recyclability, and has become a major component in sealant formulation. Nanoscale calcium carbonate in the powdered form is readily manufactured nowadays, mostly through precipitation route to control the size and morphology. Surface treatment is crucial for utilizing NCC in sealants. Native $CaCO_3$ is hydrophilic. As a result, it tends to agglomerate in organic polymers and plasticizers. NCC, in particular, has a greater propensity for agglomeration because of its small size and large specific surface area. NCCs are surface treated to render them hydrophobic and improve their dispersibility in hydrophobic systems. Surface treatment also improves polymer matrix compatibility, thus improving interfacial adhesion between extender and polymer.

It has been found that the particle size, specific surface area, mass fraction, morphology, pH value, magnesium content, oil absorption value, moisture content, and other characteristics of supplied nanoscale calcium carbonate all have impact on the performance of the sealant incorporating these nanoparticles. The need to specify the characteristics of NCC which relate to sealant performance comes from the following facts. First, the agreements between customers and suppliers do not always cover all material characteristics that have influences on performance and/or processability of sealants or they have been interpreted differently by the customers and suppliers. Second, nanomaterials are relatively new. Material properties can depend on the techniques to measure them. Therefore, providing information regarding characteristics of nanoscale calcium carbonate in sealants will facilitate the communication between customers and suppliers.

This part of ISO 18473 lists the properties, measurements, and characteristics of nanoscale calcium carbonate and intents to aid its acceptance and application in sealants.

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Functional pigments and extenders for special applications —

Part 1:
Nanoscale calcium carbonate for sealant application

1 Scope

This part of ISO 18473 specifies requirements and corresponding methods of test for surface treated nanoscale calcium carbonate in powder form for sealant application.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 787-2, *General methods of test for pigments and extenders — Part 2: Determination of matter volatile at 105 °C*

ISO 787-5, *General methods of test for pigments and extenders — Part 5: Determination of oil absorption value*

ISO 787-9, *General methods of test for pigments and extenders — Part 9: Determination of pH value of an aqueous suspension*

ISO 3262-1, *Extenders for paints — Specifications and methods of test — Part 1: Introduction and general test methods*

ISO 3262-6, *Extenders for paints — Specifications and methods of test — Part 6: Precipitated calcium carbonate*

ISO 9277, *Determination of the specific surface area of solids by gas adsorption — BET method*

ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

3 Terms and definitions

For the purposes of this part of ISO 18473, the following terms and definitions apply.

3.1
nanoscale
size range from approximately 1 nm to 100 nm

Note 1 to entry: Properties that are not extrapolations from a larger size will typically, but not exclusively, be exhibited in this size range. For such properties, the size limits are considered approximate.

Note 2 to entry: The lower limit in this definition (approximately 1 nm) is introduced to avoid single and small groups of atoms from being designated as nano-objects or elements of nanostructures which can be implied by the absence of a lower limit.

[SOURCE: ISO/TS 80004-2:2015, 2.1]

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