



Classification of titanium dioxide powders poses analytical challenges for manufacturers

The classification of titanium dioxide powders as potentially carcinogenic (Carc., cat. 2) was published on 18th February 2020.¹ A transitional period applies until 1st October 2021, thereafter the classification must be implemented within the whole supply chain. The manufacturers of titanium dioxide pigments are currently conducting comprehensive studies to be able to make clear statements regarding the classification of their products. Manufacturers do not see themselves in a position to do this, yet. The reason lies in the complex classification entry itself, requiring extensive, new analytics to enable sound decisions.

Which titanium dioxide powders need to be classified?

The classification includes titanium dioxide powders and titanium dioxide containing powders which have a TiO₂ content in particles with an aerodynamic diameter ≤ 10 µm of ≥ 1 %wt. Liquid mixtures are not affected by the classification. However, if such fine particles are contained, a warning must be given about the formation of dangerous droplets (EUH211). Solid mixtures with a titanium dioxide content of 1 %wt. or more must bear the additional information EUH212.²

Due to the complex nature of the classification, no decision can be made regarding the classification based on the titanium dioxide content of a powder alone. This requires extensive analysis.

Why are these analytical data not already available to the manufacturers?

Due to the physical effects of light scattering, the particle size has a considerable influence on the properties of pigment powders. Therefore, this parameter is very closely monitored and controlled by the manufacturers during production. The results of these particle size measurements have so far been the standard, which are given, for example, as a d50 value in technical data sheets. However, these data are not suitable for determining whether, or not a titanium dioxide powder falls under the classification.

The classification entry refers to the aerodynamic diameter of the particles, not the physical one. While the physical diameter is typically measured directly on the powder, measurements on aerosol particles are necessary to determine the aerodynamic diameter. To do this, the powder must first be transferred into such an aerosol, with aggregates and agglomerates playing an important role. This means that even powders whose primary particles have physical dimensions below 10 µm can drop out of the classification if the measured aerodynamic diameter is more than 10 µm.

What are the analytical challenges?

The aerodynamic diameter describes the sinking behavior of a particle as a dust particle in still air. In addition to the shape of the particles and the density of the substance, the formation of aggregates and agglomerates leads in particular to significant deviations between the physical

¹ Delegated Regulation (EU) 2020/2017, published in the Official Journal of the EU L44 and L51.

² See also VdMi FAQs Consequences of the classification of titanium dioxide powders ([Download](#)).

and aerodynamic particle diameter of a powder. Thus, new measurement data need to be generated.

There are various international standards³ available for measuring an aerodynamic diameter. However, these have so far only been developed and used in the field of occupational safety. Still, not every measuring method is suitable for every sample. The manufacturers are currently in the process of characterizing their commercially available titanium dioxide pigments using the various measuring methods. This not only requires extensive comparative studies, but also close cooperation with the developers of new test methods. These preliminary tests are correspondingly time-consuming, without which, however, no well-founded classification of titanium dioxide powders would be possible. Furthermore, there are no sufficient measuring capacities available for all standards.

Summary – current status

Due to all of these influences, the selection of the measurement method is essential for a well-founded, sound classification decision. The manufacturers of titanium dioxide pigments are currently busy finding suitable measurement methods for their products and preparing comparative studies. The extensive comparative studies are not only required in order to be able to make a valid classification decision, but also serve as justification with regard to possible inquiries from authorities.

Once the necessary preliminary work has been completed, the affected products can be characterized reliably and reproducibly. As soon as the measurement results are available, the manufacturers can inform the downstream users.

We expect the results in spring 2021.

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³ For example EN 15051, DIN 55992, ISO 17199 or ISO 13320.