

Experiences and needs of industries to meet the analytical challenges of the EU Nano-Definition

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EU RECOMMENDATION on the definition of nanomaterial (2011/696/EU) - to be revised ... soon ...

The EU recommendation for a nanomaterial ought to be reviewed in 2014:

„A natural, incidental or manufactured material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for 50 % or more of the particles in the number size distribution, one or more external dimensions is in the size range 1 nm - 100 nm.

In specific cases and where warranted by concerns for the environment, health, safety or competitiveness the number size distribution threshold of 50 % may be replaced by a threshold between 1 and 50 %.

By derogation from the above, fullerenes, graphene flakes and single wall carbon nanotubes with one or more external dimensions below 1 nm should be considered as nanomaterials.”

Particle Size Measurement - General

- 1 EU recommendation of a definition is quite inclusive, so many different sectors of industries are affected.
- 2 One sector of in industry are the pigment and filler manufacturers and down-stream users like the paint industry as well.
- 3 Methods for the determination the “nano status” must be
 - fast and conclusive
 - made with accessible equipment
 - able to determine a given material being “non-nano” as well as “nano”.
- 4 The focus should be on real and existing materials. Strange particle size distributions are in the vast majority of cases a thought experiment. So they should not complicate the standard choice of methods and evaluations.

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- Electron Microscopy ... comes closest to being able to satisfy the requirements of the definition ...
- None of the simple commonly available methods used ... (LD, LDS, CLS) can be recommended as a single method for identifying a nanomaterial according to the EU definition.
- A tiered flowchart
- Expertise and knowledge of the substances in question is needed to obtain meaningful results.

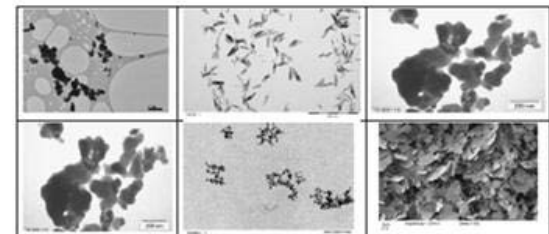


JRC TECHNICAL REPORTS

Basic comparison of particle size distribution measurements of pigments and fillers using commonly available industrial methods

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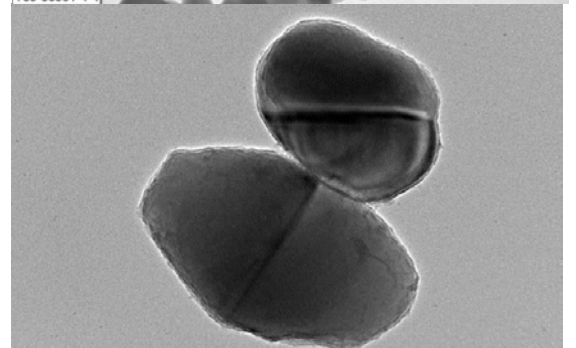
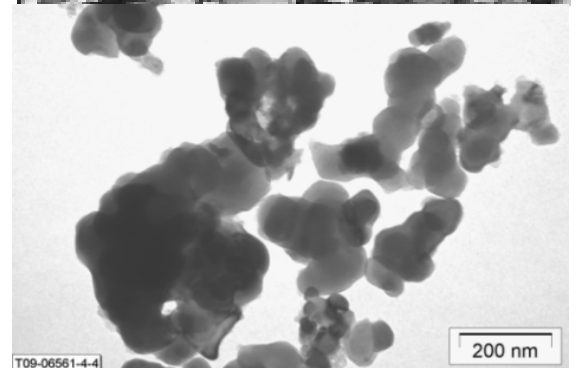
Report EUR 26316 EN



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Examples for pigments and fillers used in the JRC Eurocolour project:

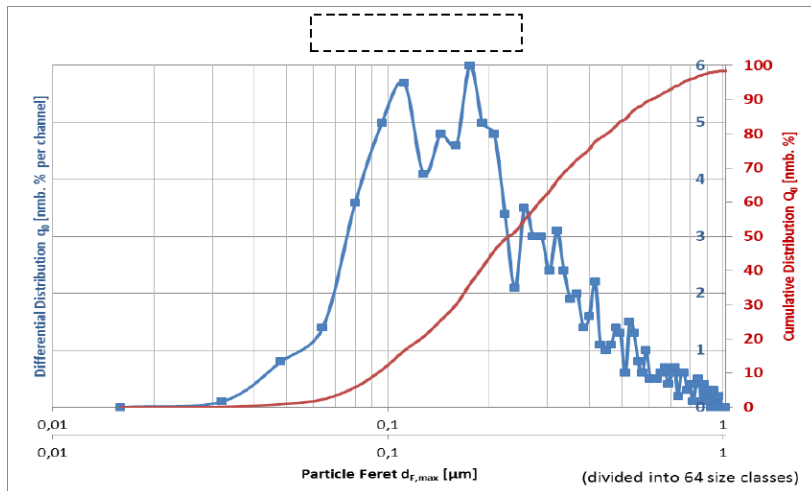
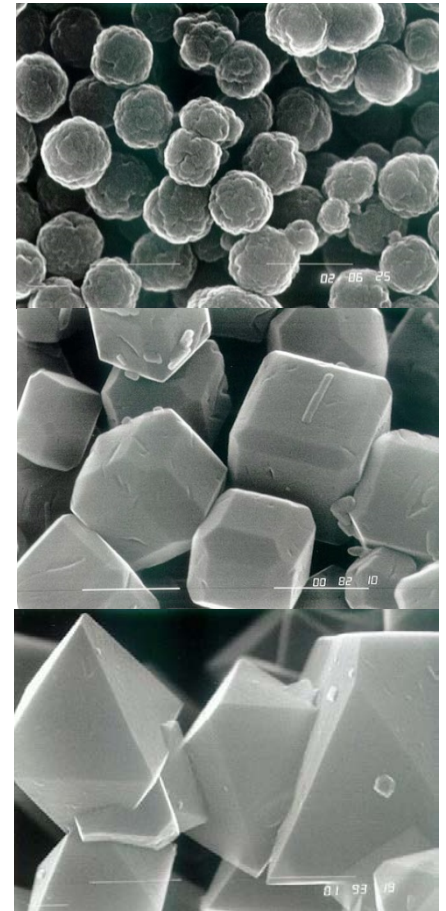
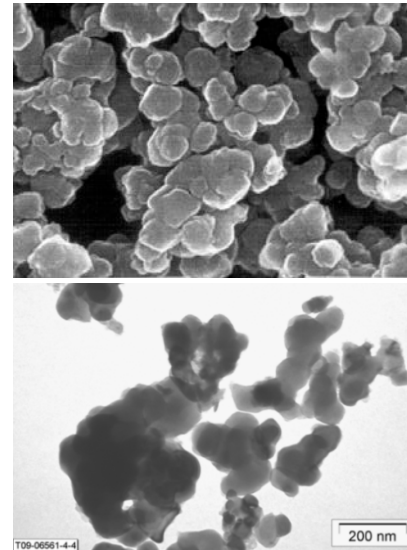
- 1 Al-Co-Blue Spinell Pigment CoAl_2O_4
- 2 Pigment Yellow 83/Organic Pigment
- 3 Pigment Red 101/ Fe_2O_3
- 4 Pigment Yellow 42 (Trans. FeOOH)
- 5 TiO_2 Rutile
- 6 TiO_2 Anatase
- 7 “Metal Pigment 2” – Cu/Zn alloy
- 8 Pyrogenic Silica



Particle Forms and Particle Size Distribution

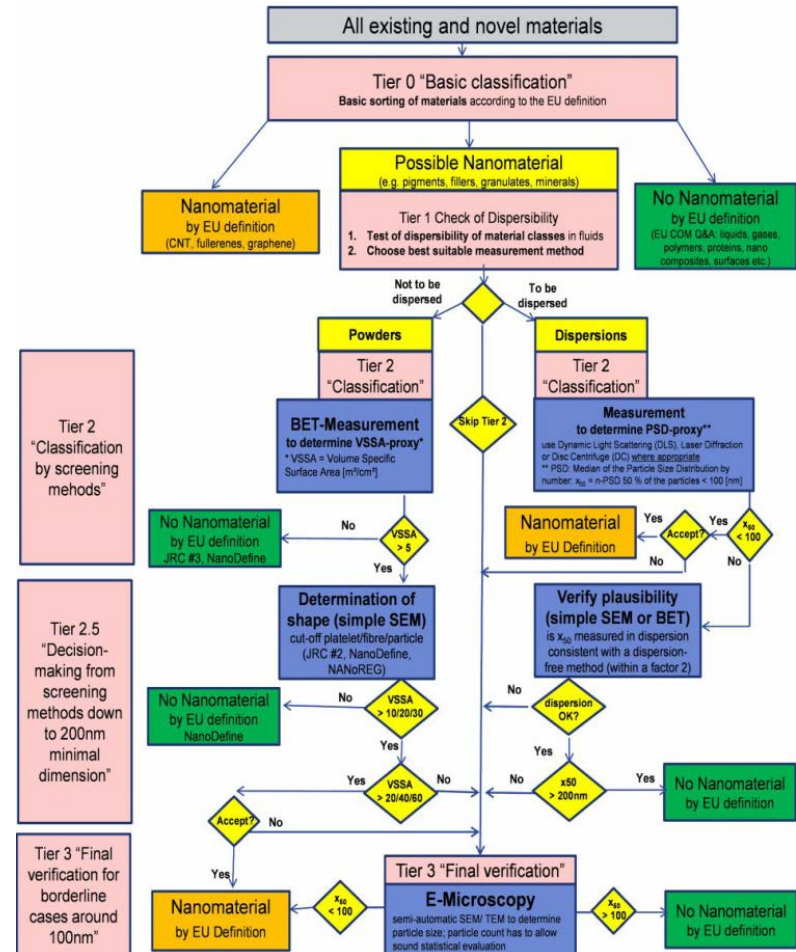
The particles in question are typically

- 1 irregularly formed
- 2 aggregated
- 3 part of a distribution at least an order of magnitude wide



Tiered Measurement Strategy

- 1 Pigments and fillers are often near the threshold of 100 nm.
- 2 So the conditions for the “shortcuts” stated are not fulfilled for these substances

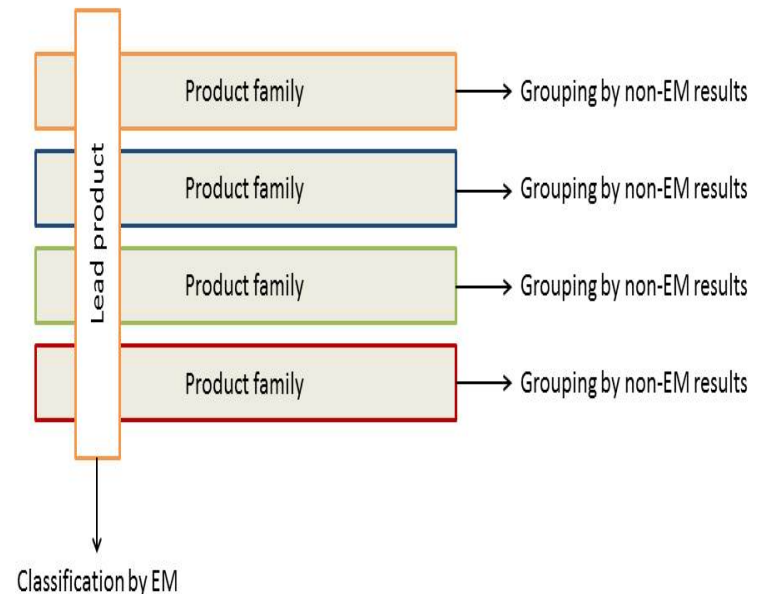


Particle Size Measurement - General

- Sample preparation is of extreme importance: The particles detected during the measurement are usually the result of the dispersing process.
- Technical know how and familiarity with the material in question is necessary for a reproducible sample preparation.
- The procedure must be optimized for each material and each kind of instrument used.
- The particle size distribution of commercial pigments and fillers can encompass more than one order of magnitude.
- It is equally important to determine that a given material **is** or **is not** a nano material with respect to the EU recommendation.
- The methods must be sufficiently available.

Product Family Approach

- In some cases product families can be defined in which it can be unequivocally determined which specimen has a higher mean particle size than the other.
- In these cases it may be sufficient to characterize one member, the lead, of the family, by electron microscopy and do the following grouping by other means.



Thank you for your attention