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Dimensional measurement of TiO₂ particles in powder form by SAXS and SEM

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Developments of nanomaterials had an important known evolution during the last thirty years for different industrial sectors¹. Titanium dioxide is one of the most produced and exploited nanomaterials in the industry². Indeed, TiO₂ has various applications; it can be used as a white pigment for paint and food products and is also used as a UV filter in sunscreen lotions. The characterization of TiO₂ nanoparticles, contained in consumer products remains a challenge because of their structure (polydispersity, polymorphism) and their environment which remains generally complex and requires several characterizations techniques. Electron microscopies are the first recommended techniques for the dimensional characterization of nanomaterials. In comparison with the results obtained by the scanning electron microscope (SEM), another technique, SAXS (Small Angle X-Ray Scattering), can be used for the indirect characterization of nanomaterials (simple or introduced into a complex matrix).

The first step of this study is to compare the dimensional measurements of TiO₂ nanoparticles in powder form with two different techniques: SEM (direct method) and SAXS (indirect method) and with two different measurands, an equivalent area diameter for SEM and specific surface area for SAXS. The second part should be to avoid the sampling preparation steps with *in situ* dimensional measurement.

¹ Van Broekhuizen F.A. and van Broekhuizen J.C., Nanotechnology in the European Construction Industry, State of the art, Executive Summary. European Commission, 2009

² Marina E. Vance, Todd Kuiken, Eric P. Vejerano, Sean P. McGinnis, Michael F. Hochella Jr., David Rejeski and Matthew S. Hull, Nanotechnology in the real world: Redeveloping the nanomaterial consumer products inventory, Beilstein J. Nanotechnol. 2015, 6, 1769–1780. doi:10.3762/bjnano.6.181.