

## Colloidal synthesis and processing of nanostructured titania coatings

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Colloidal processing allows producing nanostructured ceramics and composites with tailored microstructure and varied shapes from bulk bodies to coatings, self-sustaining films and laminates [1,2]. The control of interparticle forces makes it possible the synthesis of nanoparticles as well as their further consolidation into homogeneous films and coatings by using wet forming methods. The present work describes the processing parameters involved in the synthesis and stabilization of titania nanoparticles for the production of nanostructured coatings, demonstrating the increased reliability and enhanced properties achieved after an adequate control of the colloid chemistry and the rheology of the suspensions. . On one hand, the synthesis of titania nanoparticles by a colloidal sol-gel route is described, as well as the formation of thin coatings by conventional methods like dipping or electrophoretic deposition. On the other hand, different commercially available nanosized titanias are studied and compared, including powders and colloidal suspensions. The low solids contents of commercial suspensions of nanosized titania are limiting factors so that in this work concentrated suspensions are prepared by dispersing the dry nanoparticles in nanoparticulate sols. The stability of those concentrated suspensions of titania nanopowders is studied in terms of zeta potential measurements as a function of pH, type and concentration of polyelectrolytes, mixing time using sonication, etc. The preparation and rheological properties of concentrated suspensions is also reported. Finally, the influence of the processing parameters on the properties of the resulting coatings produced by dipping, electrophoretic deposition and plasma spraying is discussed.

[1] F.F. Lange, J. Am. Ceram. Soc. **72**, (1989) 3.

[2] R. Moreno, Adv. Appl. Ceram. **111**, (2012) 246.