

EFFECT OF SURFACE MODIFIERS ON THE NANOPARTICLES ELECTRO-DRIVEN ASSEMBLY

Begoña Ferrari, Instituto de Cerámica y Vidrio (CSIC), Madrid, Spain
bferrari@icv.csic.es

Zoilo Gonzalez, Instituto de Cerámica y Vidrio (CSIC), Madrid, Spain

Joaquin Yus, Instituto de Cerámica y Vidrio (CSIC), Madrid, Spain

Claudine Filàtre LCMI, Université de Franche-Comté, Besançon, France

Antonio Javier Sanchez-Herencia Instituto de Cerámica y Vidrio (CSIC), Madrid, Spain

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Understanding the colloidal behavior of particles is mandatory to prepare stable and disperse suspensions suitable for EPD. Up today, most of the proposed models for the EPD kinetics have been formulated considering the electrophoresis process, where depositing features are quantified by the sticking factor, a probabilistic and empiric parameter. Proposed models have demonstrated that interparticles forces are also the clue to understand the way in which particles compact on the electrode under the influence of an electric field in an electrostatically stabilized suspension. Empirically in those systems, the morphology, the crystallography and the reactivity of the particles, determine the charge distribution in their surfaces, while the ionic strength modulates the charge density. However, new perspectives of particles assembly verified that in suspensions stabilized by an electrosteric mechanism, under similar electric conditions, changes in nature, length and ionization strength of surface modifiers or ligands determine the interaction forces among nanoparticles, resulting in an effective tool to manage nanoparticles flocculation and hence kinetics and ordering during the film growth. This fact has been specifically proved in the electrophoretic deposition of nanoplatelets or in the spatial orientation of nanocrystals. In this paper, we will discuss the literature that evidences how the surface modifiers not only define the deposition rate, but they also determine the deposition behavior and the final microstructure of the coating. Particularly the Layer-by-Layer (LbL) technology, understood as the alternate absorption of cationic and anionic polymers onto the particle surface, will be shown as an example of the compaction tailoring in 3D ceramic electrodes for supercapacitor manufacturing.