Optimization of $BiFeO_3$ suspensions stabilization

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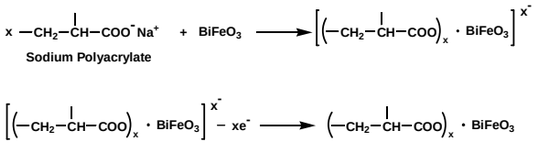
Electrostatic stabilization of aqueous suspensions of single phase bismuth ferrite $BiFeO_3$ (BFO) sub-micrometric particles was investigated.
The effects of several parameters on the BFO suspension stability were investigated by means of Design of Experiments (DoE) techniques. Particularly, in a first screening Full Factorial experimental design, four input factors, i.e. BFO concentration, type and concentration of dispersant agent and sonication time were considered. Their effect on the suspension stability was evaluated in terms of Zeta potential values as well as turbidity measurements (which are correlated to the amount of suspended particles).
The results showed that electrostatic stabilization of the aqueous suspension of BFO submicrometric particles can be accomplished in the basic pH range of 8-9.
In the presence of sodium polyacrylate (PAA-Na) based dispersant agents, the isoelectric point (IEP) of the bismuth ferrite suspension shifted to higher pH values and the absolute value of zeta potential was increased in a large range of pH above the (IEP).
After having determined the main factors affecting the suspension stability, its optimization has been carried out by Surface Response Methodology (SRM).
The as-determined optimized conditions were then experimentally applied to confirm the prediction ability of the model.
The stabilized suspension was finally exploited in order to electrophoretically deposit BFO thin films on Both conductive and non conductive substrate. The structural, morphological and electrical characteristics of the obtained films together with thickness measurements were studied. The BFO films, homogeneous in thickness, free from pinholes and cracks were successively sintered and microstructurally characterized also in term of photocatalysis response.



Figure/Scheme: reaction between BFO and PAA-Na