

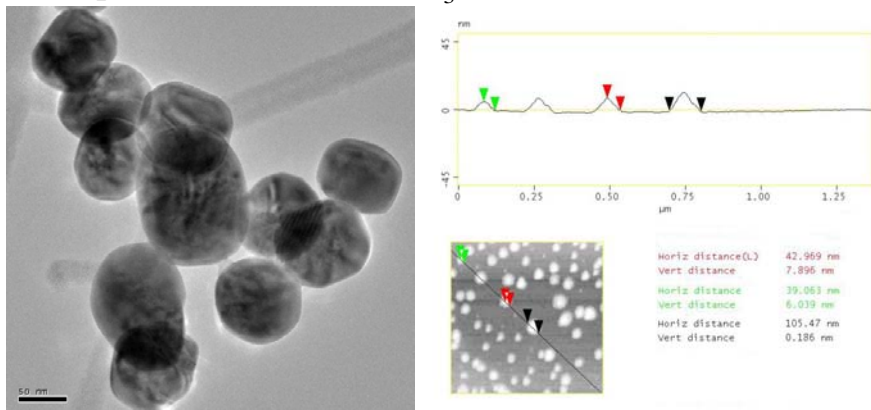
Electrophoretic Deposition of Nanoscale Thin Films and Multilayers

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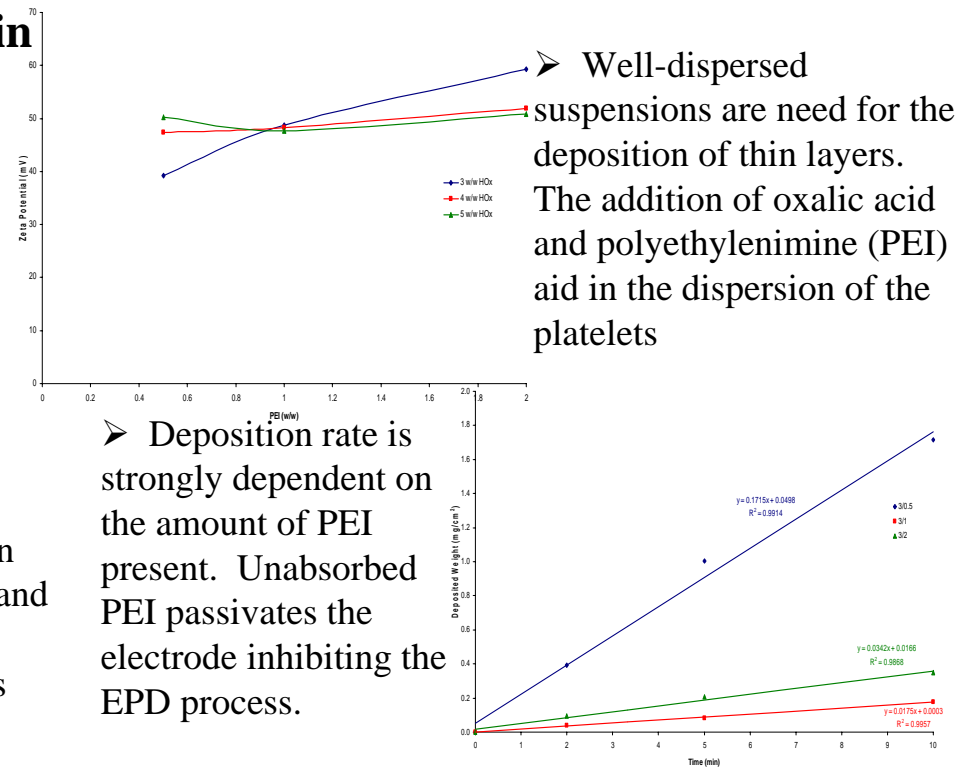
Abstract:

Electrophoretic deposition (EPD) is a particulate deposition technique useful in the creation of layer with controlled thickness. Combining nanoparticle techniques with EPD can lead to the formation of thin layers. Nanoparticle synthesis and dispersion are key factors in the eventual deposition of thin layers. Therefore, current work has focused on the synthesis and dispersion of nano-BaTiO₃.



TEM and AFM images of hydrothermal BaTiO₃ showing that the particles are nanotabular. The synthesis is based on previous work by Miller¹.

¹D.V. Miller, "Synthesis and Properties of Barium Titanate Nanocomposites," Ph.D. Thesis, The Pennsylvania State University, (1991).



Well-dispersed suspensions are needed for the deposition of thin layers. The addition of oxalic acid and polyethylenimine (PEI) aid in the dispersion of the platelets

Deposition rate is strongly dependent on the amount of PEI present. Unabsorbed PEI passivates the electrode inhibiting the EPD process.

Conclusions:

EPD, when combined with nanoparticles synthesis and dispersion, is an excellent technique for the deposition of thin layer with dense homogenous microstructures. Nanotabular BaTiO₃ suspension the beginning step for the deposition of thin dielectric layers.

Future Work:

- Characterization of deposited layers for thickness and microstructure.
- Create a nano-multilayer structure using EPD

