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Spectroscopic studies of the effects of mechanochemical synthesis on BaTiO₃ nanocolloids prepared using high-energy ball-milling

Journal of Applied Physics 124, 165501 (2018); <https://doi.org/10.1063/1.5046682>I. U. Idehenre^{1,2}, Y. A. Barnakov^{1,3}, S. A. Basun^{1,3}, and D. R. Evans¹[View Affiliations](#)



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ABSTRACT

BaTiO₃ ferroelectric nanoparticles have provided benefits to numerous liquid crystal applications, while the chemistry of these nanocolloids was not fully understood. In this paper, infrared absorption spectra reveal that ferroelectric BaTiO₃ nanocolloids are more than BaTiO₃ nanoparticles in heptane with an oleic acid surfactant as previously believed. It is shown that ball-milling plays a bigger role than just a top-down approach for creating nanoparticles; it also is a means of mechanochemical synthesis. This paper demonstrates that mechanochemical synthesis is responsible for converting a large amount of the oleic acid to a metal carboxylate compound. This suggests that one cannot treat the oleic acid as a mere surfactant when considering new methods/recipes to improve fabrication processes for creating highly ferroelectric nanoparticles or when exploring the various effects that the organic additives may have on liquid crystal systems.

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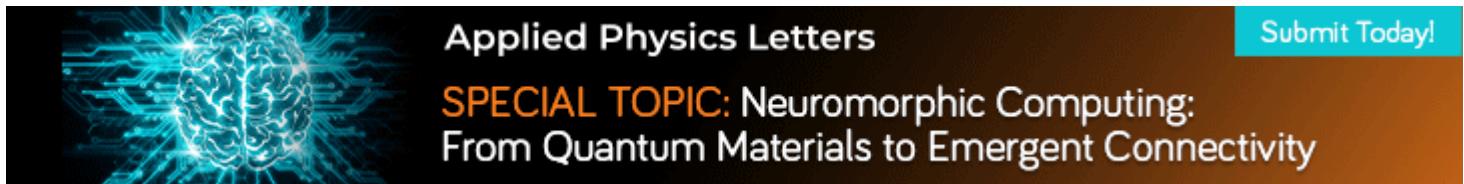
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