3.20 pm **Synthesis and characterization of Fe doped single-phase multiferroic**

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Discovery of new complex oxides that exhibit coupled ferromagnetic and ferroelectric properties is of great interest for the design of functional magnetoelectrics, in which research is driven by the long-term technological prospect of controlling ferromagnetic hysteresis with an electric field and vice versa. Multiferroics offer opportunities for sensors, 4-state logic (NVM), and spintronics. Single-phase coupled multiferroics are of theoretical interest due to the possibility of a quantum character in such coupling. $BaMn_3Ti_4O_{14.25}$ (BMT-134) is a recently discovered single-phase multiferroic complex oxide exhibiting antiferromagnetic and ferroelectric behavior. In an attempt to exhort a room temperature ferroic order response, BMT-134 was doped with Fe at varying degrees. Using a chemical solution processing approach, three distinct variations of nanocrystals were synthesized; $BaMn_{3-x}Fe_xTi_4O_{14.25}$ (BMFT) with $x = 1$, $x = 1.5$, $x = 2$. All variants were found to belong to the same hollandite crystal class as BMT-134 and Fe was shown to be incorporated into the crystals of each, proportional to the precursor ratios. Using EDS, elemental composition was determined qualitatively and iron content was corroborated with precursor amount. Mossbauer spectroscopy was used to determine the oxidation state of Fe and to probe its chemical environment. TEM and SEM techniques were used to determine size distribution and morphology of the nanoparticles and of their packing within pellets. The effective permittivity of pellet pressed capacitors was measured for each Fe variant.

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