Abstract Submitted
for the NWS08 Meeting of
The American Physical Society

Phase transitions and ferroelectricity in $NaSb_3F_{10}$ PETER WU, PANOS PHOTINOS, SIDNEY ABRAHAM, JASON MATTHEWS[1], R. CHRISTIE, Southern Oregon University — The structural prediction that $NaSb_3F_{10}$ is a new ferroelectric has been confirmed experimentally. The mean phase transition temperature $T_c \approx 461$ K with an associated entropy change $\sim$6 J mol^{-1} K^{-1}. The colorless crystals melt at $T_m \sim 515$ K with decomposition starting at $\sim$600 K. A thermal hysteresis in T_c of $\sim$35 K between heating and cooling at 25 K min^{-1} is typical of a first order phase transition. The space group in ferroelectric phase III is $P6_3$, that in the predicted antiferroelectric phase II is $P6_322$, a supergroup of $P6_3$. The space group of prototypic nonferroic phase I is supergroup $P6_3/mmc$, of which the space group of phase III is not a subgroup. The dielectric permittivity at 100 Hz increases more than an order of magnitude from 350 K before undergoing a major inflection at $T_c = 460(10)$ K; it increases thereafter to T_m. The dielectric loss at 100 Hz is low but increases an order of magnitude from its value at $\sim$350 K before undergoing an inflection at $\sim$460 K, also rising steadily thereafter to T_m. The reproducible dielectric hysteresis loop, with $P_S \approx 20\mu$ C m^{-2} at room temperature under the application of 0.3 MV m^{-1} a.c. or greater, unambiguously verifies the predicted ferroelectric property. The pyroelectric coefficient $\langle p \rangle = 17(5)\mu$ C m^{-2} K^{-1} at 298 K.

[1]Currently enrolled at UO

Peter Wu
Southern Oregon University

Date submitted: 18 Apr 2008 Electronic form version 1.4