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Broadband Permittivity Measurements of Ruddlesden-Popper $Sr_{n+1}Ti_nO_{3n+1}$(n=1,2,3) Thin Films N. ORLOFF, W. TIAN, D. SCHLOM, J. BOOTH, I. TAKEUCHI — In order to explore the microwave dielectric response of Sr_2TiO_4, $Sr_3Ti_2O_7$, and $Sr_4Ti_3O_{10}$ thin films, we have performed broadband in-plane quantitative complex permittivity(ε) measurements on $Sr_{n+1}Ti_nO_{3n+1}$(n=1,2,3) thin films in the frequency range 100Hz-40GHz. The films, of approximately 160 nm thickness, were fabricated by molecular beam epitaxy[1], and standard lithographic techniques were used to define coplanar waveguide transmission lines and interdigitated capacitors using gold. We extracted ε from the measured complex S-parameters (.01-40GHz) and the complex impedance (100Hz-.001GHz), which were measured at 70K, 150K, 200K, and 250K using a cyrogenic probe station. We found that below ∼10GHz the ε's of these thin films were approximately constant with frequency: ε ≈38, 48, and 100 for $Sr_{n+1}Ti_nO_{3n+1}$(n=1,2,3) respectively. In addition, the measured value for ε of Sr_2TiO_4 is consistent with recent theoretical calculations [2]. We will discuss in detail the temperature and electric field dependence of the measured complex ε for these material systems. [1] J.H. Haeni, *et al* APL, **78**, 21 (2001) [2] C.J. Fennie and M.K. Rabe, PRB, **68**, 184111 **(**2003)

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