Abstracts

Dielectric sleeve resonator techniques for variable-temperature microwave characterization of ferroelectric materials

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Low-loss sleeve resonators can be used for accurate microwave dielectric characterization of rod-shaped test specimens. The test specimen is inserted into the dielectric sleeve resonator and placed centrally in a metal cavity. With the use of additional sleeve resonators having differing external diameters or permittivities, a single specimen can be characterized at multiple frequencies. Sleeve resonators can also be employed for accurate dielectric characterization of high-permittivity specimens having dielectric loss factors greater than 0.001. Closed-form solutions for TE/sub 0np/ resonant mode structure are given. Uncertainty relations for permittivity and dielectric loss are also shown, which demonstrate that when sample electric energy filling factors are greater than 0.4, relative uncertainties in measured permittivity and dielectric loss tangent are less than 1% and 4%, even for relative permittivities greater than 600. Example measurements are given that illustrate how this dielectric resonator system can be employed for dielectric characterization of ferroelectric materials at temperatures both near or far from their Curie temperatures.

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