TEMPERATURE CONTROL SYSTEM

Microwave Dielectric Measurements in High Temperature

Measurement Demonstration

Measurements acquired with *EpsiMu*® PE13 from 30° to 80° at 100 MHz and 1 GHz

Ethanol ≥99.8%

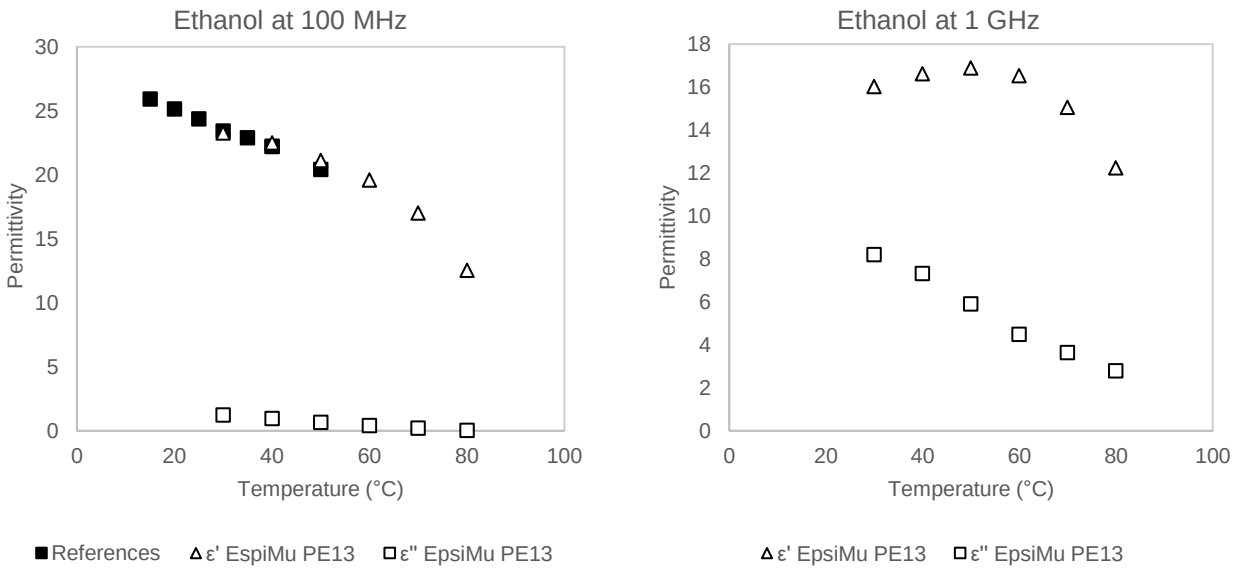

Fig. 4. (left) Real part of permittivity ε' (Δ) and imaginary part of permittivity ε" (☐) EpsiMu measurement of ethanol as function of temperature, from 30° to 80°, at 100 MHz; comparison with references from Puranik et al, 1993, Khirade et al, 1999 and Checinska-Majak et al, 2012 (■); (right) Real part of permittivity ε' (Δ) and imaginary part of permittivity ε" (☐) EpsiMu measurement of ethanol as function of temperature, from 30° to 80°, at 1 GHz. Measurement errors are not displayed for clarity reasons; please see Technical Properties for measurement errors.

MULTIWAVE INNOVATION SASU
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APU10 (absorbent magnetic material)

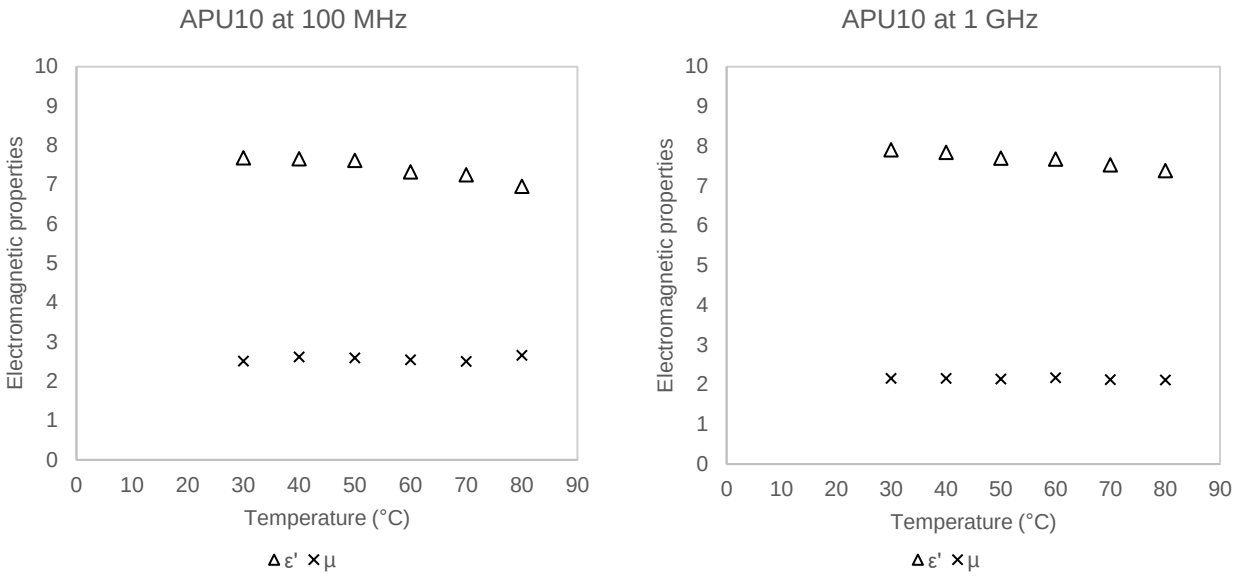

Fig. 5. (left) Real part of permittivity ε' (Δ) and real part of permeability μ (x) EpsiMu measurement of APU10 as function of temperature, from 30° to 80°, at 100 MHz; (right) Real part of permittivity ε' (Δ) and real part of permeability μ (x) EpsiMu measurement of APU10 as function of temperature, from 30° to 80°, at 1 GHz. Measurement errors are not displayed for clarity reasons; please see Technical Properties for measurement errors.

Measurements acquired with EpsiMu® 7mm from 30° to 80° at 530 MHz and 12 GHz

Air (constant permittivity with temperature)

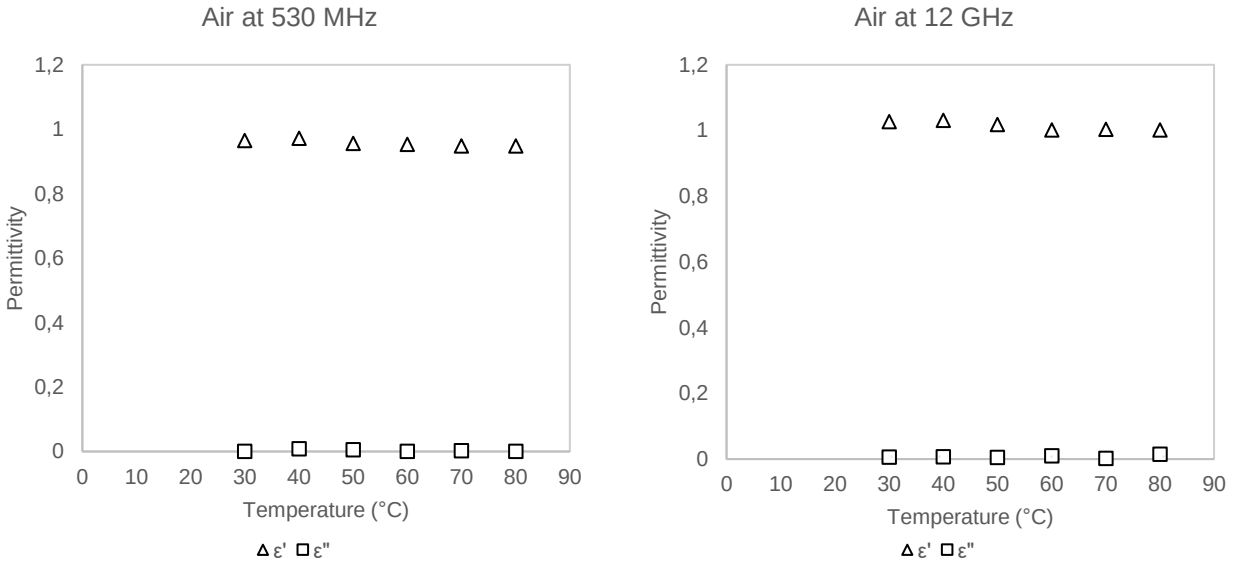

Fig. 6. (left) Real part of permittivity ε' (Δ) and imaginary part of permittivity ε" (□) EpsiMu measurement of air as function of temperature, from 30° to 80°, at 530 MHz; (right) Real part of permittivity ε' (Δ) and imaginary part of permittivity ε" (□) EpsiMu measurement of air as function of temperature, from 30° to 80°, at 12 GHz. Measurement errors are not displayed for clarity reasons; please see Technical Properties for measurement errors.

APU10 (absorbent magnetic material)

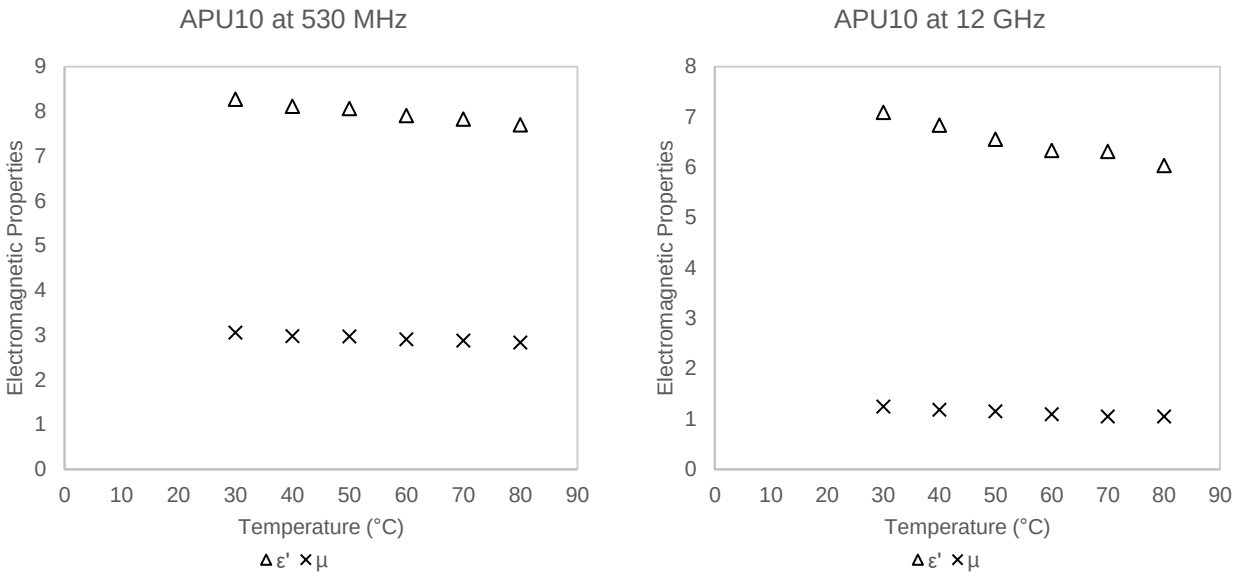

Fig. 7. (left) Real part of permittivity ε' (Δ) and real part of permeability μ (x) EpsiMu measurement of APU10 as function of temperature, from 30° to 80°, at 530 MHz; (right) Real part of permittivity ε' (Δ) and real part of permeability μ (x) EpsiMu measurement of APU10 as function of temperature, from 30° to 80°, at 12 GHz. Measurement errors are not displayed for clarity reasons; please see Technical Properties for measurement errors.

Technical Properties

	***EpsiMu*® 7mm**	***EpsiMu*® PE13**
Temperature Range	Room temperature to 85°C	
Temperature Precision	1°C	
Frequency Range	10 KHz to 8 GHz	10 KHz to 18 GHz
Heating delay time	No time restrictions (seconds)	
Number of T°C points	70 points (starting at 15°C)	
Sample type	Washer-shaped solids	Solids, powders, liquids, etc.
Sample length range (mm)	0.2 to a few mm ($<\frac{\lambda}{2}$)	1 to sample holder length
Measurement Accuracy	$\frac{\Delta\varepsilon'}{\varepsilon'}$ <5%; $\frac{\Delta\varepsilon''}{\varepsilon''}$ <10%	$\frac{\Delta\varepsilon'}{\varepsilon'}$ <5%; $\frac{\Delta\varepsilon''}{\varepsilon''}$ <10%
Length of Sample-Holder	-	24mm or higher