

Temperature measurement in the ultrasonic bath

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Abstract

During the ultrasonic experiments, a temperature measurement error was observed. This error is due to the temperature measuring equipment (the material from which it is made), the position of the thermocouple in the ultrasonic bath, as well as the ultrasonic operating frequency.

This phenomenon is anticipated to be the consequence of the shear forces between the surrounding liquid and the thermocouple, thus generating local energy, converted into temperature, at the surface of the thermocouple. As can be seen in the figure below, we have a significant increase in temperature when the ultrasounds are switched on, then remaining in a steady state during the ultrasound treatment period and when the ultrasounds are switched off, the thermocouple temperature rapidly drops reaching the temperature of the working liquid [1].

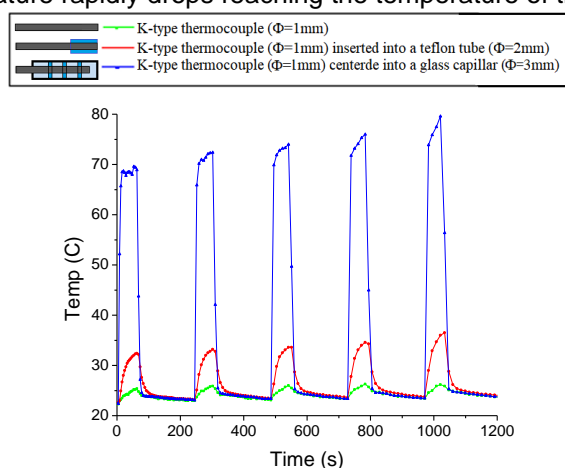


Figure 1. The measured temperature by the 3 thermocouples in time at a frequency of 1146 kHz, amplitude 5

The graph above, shows the tested (same type) thermocouple registration. Three thermocouples were used, positioned in the middle of the ultrasound bath, at a frequency of 1146 kHz, with an ultrasound treatment working in the pulse mode: 1 minute on and 3 off. The Meinhardt generator and amplifier were used as an ultrasound source. Determinations were made at different amplitudes and frequencies.

References

[1] K. Hynynen, D.K. Edwards, Temperature measurements during ultrasound hyperthermia, *Medical Physics*, Vol 16, No 4, (1989) 618,

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