Generalized Parameter for the Election of a Suitable Technique and the Optimization of Differential Photothermal Experiments

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We present a generalized parameter K = "useful signal/uncertainty" for a differential photothermal experiment. We show how this parameter offers a quantitative evaluation of the metrological characteristics of the experiment to measure small changes of the thermal diffusivity and the thermal effusivity. By means of the parameter K, one demonstrates rigorously that for small changes, the differential measurement methods are preferable to the non-differential ones.

This parameter also allows us to compare the metrological characteristics of two differential experiments realized with different photothermal techniques. The results of the digital simulation of two differential experiments realized on the direct and inverse photopyroelectric techniques are presented and discussed. In this way, the power of the parameter K to optimize the frequency range and the dimensions of the sample is demonstrated.