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Relative emissivity measurement through photoacoustic effect¹ YAQI ZHANG, GERALD DIEBOLD, Brown Univ — Determination of emissivity with great accuracy is significant for temperature measurement by pyrometry, radiation heat transfer and so on. Normally, emissivity is determined directly by measuring the ratio of radiation of the sample to the blackbody or indirectly through measurement of reflectance. Here, a new method employing the photoacoustic effect is introduced for emissivity measurement. Radiation of two different samples goes into an acoustic cell alternately by rotating two chopping wheels out of phase. The radiation difference will result in the generation of acoustic waves which are recorded by a lock-in amplifier. Raising the temperature of one sample while keeping the other one at constant temperature will eventually result in a balanced state where radiation from two samples at different temperatures is equalized. By recording the amplitude and phase of the acoustic signal and the temperature difference simultaneously, the balanced null point could be accurately determined, thus resulting in an accurate measurement of emissivity. Emissivities of teflon, PVC, polystyrene sheet and aeroglaze Z306 are given.

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