

On-line determination of thermophysical properties in an absorption calorimeter

F O Otieno, B O Kola and F N Onyango

Year: 1997

Abstract

A Microsoft FORTRAN 77 algorithm for calculation of the thermal absorptance α and emittance ϵ of materials for solar photothermal applications is presented. It replaces the Mathematica software package used for an earlier paper and uses data from sample heating and cooling histories obtained in an absorption calorimeter. The calorimeter is automated with a Z80 microprocessor system, which has an operating system (OS) and control programs resident in a block of type 2716 EPROMs with a working memory comprising Hitachi type 6116 static RAMs. The Z80 μ P system acquires data from the sample through thermocouples, filters, amplifiers and analogue-to-digital signal converters (ADCs) for temporary storage in the on-board RAM. The raw data are uploaded to an IBM PS/2 microcomputer for display and processing. Solutions of heat balance equations of the calorimeter are computed from the transient temperature history data using analytical and numerical methods. Results obtained for commercial copper and aluminium samples using a 60 W tungsten - halogen lamp are discussed. They compare well with those from the Mathematica package.