Temperature-dependent Thermal Properties Measurement by Solving Inverse Heat Transfer Problems

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Abstract

Inverse heat transfer problems (IHTPs) are corresponding to direct heat transfer problems, which are the courses of getting the internal temperature distribution of material by solving governing equations, with known thermal physical parameters and boundary conditions; while IHTPs are the problems of identifying thermal physical properties, boundary conditions, or internal heat sources, with known measured temperature history of internal measurement points. IHTPs provide an innovative way for temperature-dependent thermal properties measurement. The thermal properties can be identified by solving inverse heat transfer problems utilizing recorded temperature of internal measurement points. In this paper, a specimen and an experimental procedure are designed and the temperatures of internal measurement points are recorded. The temperature data is utilized to solve the inverse problem based on a least-squares minimization. Two cases are included in the paper: case 1, the temperature-dependent thermal conductivity is unknown and to be identified; case 2, both the temperature-dependent thermal conductivity and specific heat capacity are unknown. The thermal properties are identified and compared with those measured by traditional method to verify the method.

Keywords: Temperature-dependent, Thermal properties, Identification, IHTPs.

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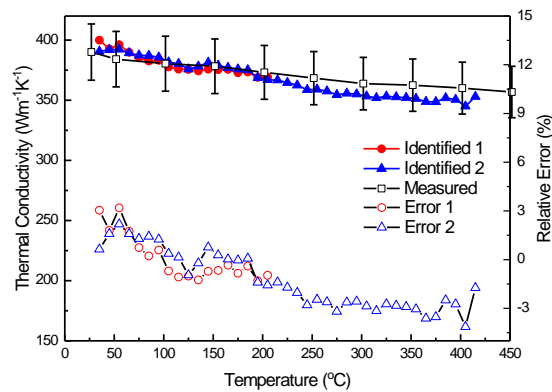**Email:** fajun_yi@126.com

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Figure 1. Comparison of identified and measured thermal conductivity for case 1

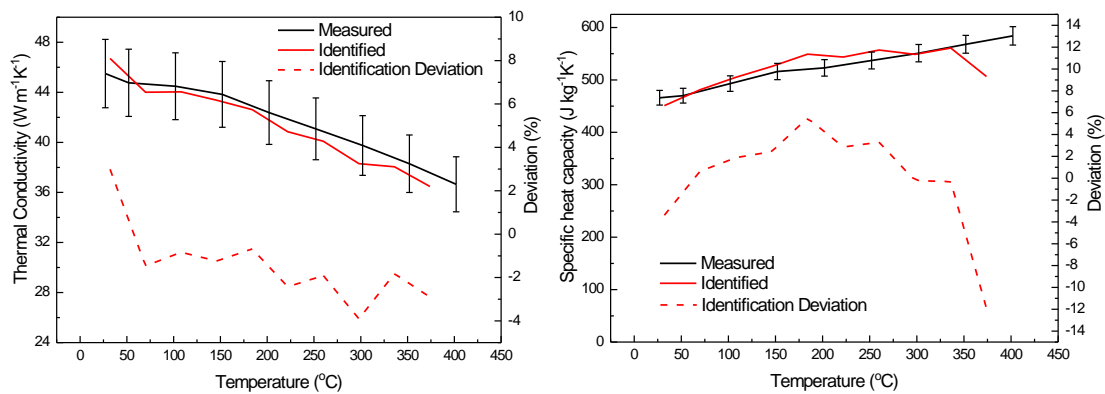

Figure 2. Comparison of identified and measured thermal conductivity and specific heat capacity for case 2

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