Technology Offer

Non-invasive procedure and device for measuring thermal diffusion

Summary

A Romanian research institute has developed a non-invasive procedure and a related device for measuring the coefficient of thermal diffusion in materials in a non-invasive way, by using only one of the sample surfaces and without affecting the material properties of the sample. Industrial partners are sought for, to finance (financial agreement) and jointly develop a prototype together (technical cooperation agreement) with the Romanian research institute.

Creation Date	18 December 2014
Last Update	05 May 2015
Expiration Date	04 May 2016
Reference	TORO20141218001

Details

Description

The method and corresponding device developed by the Romanian research institute aim to measure the thermal diffusion coefficient of a material in a non-invasive way, by using only one of the sample surfaces and without affecting the material properties of the sample.
The non-invasive method for measuring the coefficient of the thermal diffusion of a material consists in heating the sample by a continuous wave heating laser beam, intensity-modulated harmonic in time, focused on the surface of the sample as a narrow and long strip of light. A probe laser beam is applied as close as possible to the test surface of the sample and is aligned parallel to the heat source strip produced by the heating laser beam. The probe laser beam position on the quadrant photodetector is determined and the phase of the signal provided by the photodetector is measured. The thermal diffusion coefficient is then calculated as the tangent of the slope angle of the phase dependence of the distance from the heat source or of the square root of the frequency modulation.
The device that implements the method consists of a continuous wave heating laser, a harmonic modulator that modulates the intensity of the beam laser in time, providing a reference signal to a synchronous detection amplifier, a probe laser emitting on a longer wavelength than the heating laser, a beam expander, a plane mirror deflecting the laser beam with 90°, a cylindrical lens that focuses the laser beam on the surface of the sample as a narrow and long strip of light, a translation support on which the mirror and the lens are fixed, allowing them to be moved and thus also the laser beam is moved in a direction perpendicular to the sample beam, a position sensor that provides a voltage proportional to the translational movement of the support, a lens that focuses the laser beam on the sample subjected to the measurement probe, a quadrant photodetector determining the position of the probe laser beam, the synchronous detection amplifier, which amplifies the signal generated by the photodetector and provides a voltage proportional to the phase displacement of the signal and a digital storage oscilloscope or a two-coordinates recorder, which records on the ordinate axis the voltage supplied by the

synchronous detection amplifier, and the abscissa axis the voltage supplied by the position sensor.
The Romanian research institute is looking for industrial partners (SMEs) that are able to support financialy the joint development, of a specific prototype.

Advantages and Innovations

Advantages:
- The method is noninvasive and nondestructive and can be also applied to biological samples;
- It provides a larger deflection angle of the laser beam, which leads to an increase of the electrical signal produced by the photodetector and hence to an increase of the measurement accuracy;
- It provides a smaller variation in the sample temperature, which does not change the value of the thermal diffusion of the material.

Innovative elements:
- Non-invasive method for measuring the coefficient of the thermal diffusion of the material wherein the sample is heated by a heating laser beam, emitted in a continuous wave and intensity-modulated harmonic in time, focused on the surface of the sample as a narrow and long strip of light.

Stage of Development

Concept stage

IPR Status

Exclusive Rights

Keywords

Technology

01001001	Automation, Robotics Control Systems
02007008	Iron and Steel, Steelworks
09001010	Thermal material testing

Market

05001001	Diagnostic services
08002003	Process control equipment and systems

NACE

M.72.1.9	Other research and experimental development on natural sciences and engineering

Network Contact

Issuing Partner

NATIONAL INSTITUTE OF RESEARCH AND DEVELOPMENT FOR OPTOELECTRONICS

Contact Person

Laura-Cristina Luca

Phone Number
0040-264-420590

Email
laura.luca@icia.ro

Open for EOI : Yes

Client

Type and Size of Organisation Behind the Profile

R&D Institution

Year Established

1997

Already Engaged in Trans-National Cooperation

Yes

Certification Standards

ISO 9001:2008

Languages Spoken

English

Client Country

Romania

Partner Sought

Type and Role of Partner Sought

Partner Sought type: industry
Tasks to be performed by partner: to finance and develop a prototype, in joint work with the Romanian research institute.

Type and Size of Partner Sought

SME 11-50,SME 51-250

Type of Partnership Considered

Financial agreement
Technical cooperation agreement