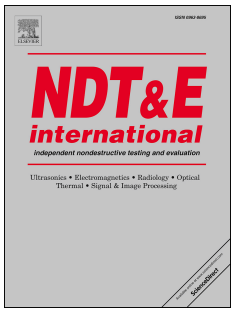
# Accepted Manuscript




Applied multiresolution analysis to infrared images for defects detection in materials

Ahmed Kabouri, Abdelhamid Khabbazi, Hussein Youlal

PII: S0963-8695(17)30072-5

DOI: 10.1016/j.ndteint.2017.07.014

Reference: JNDT 1892

To appear in: *NDT and E International*

Received Date: 1 February 2017

Revised Date: 2 May 2017

Accepted Date: 25 July 2017

Please cite this article as: Kabouri A, Khabbazi A, Youlal H, Applied multiresolution analysis to infrared images for defects detection in materials, *NDT and E International* (2017), doi: 10.1016/j.ndteint.2017.07.014.

# Applied multiresolution analysis to infrared images for defects detection in materials

Ahmed Kabouri[1,3,*], Abdelhamid Khabbazi[2], Hussein Youlal[3]

[1] University Mohammed V of Rabat, EST- LASTIMI, Salé, B.P. 227, Salé-Medina, Morocco

[2] University Mohammed V of Rabat, EST- LEME, Salé, B.P. 227, Salé-Medina, Morocco

[3] University Mohammed V of Rabat, Faculty of Sciences, UFR-ATI, BP 1014, Rabat, Morocco

[*] Corresponding author: akabouri@hotmail.com

## Abstract

In this paper, an advanced approach to characterize defects in homogeneous materials based on multiresolution analysis of infrared images is presented. This is mainly a non-destructive evaluation technique based on the flash method in transmission mode. An experimental device using infrared thermography was designed and realized. The equipment includes an infrared imager for following the temporal evolution of the temperature in the rear face of the tested sample. The other front face receives a flash from a halogen lamps excitation source. The thermal images generated at the rear face are segmented using a wavelet transform multiresolution analysis in order to extract all defects zones and subsequently processed to estimate their corresponding surface sizes. The experimental results on the test materials with hidden defects show the advantage of the segmentation technique applied to the response images of the system. High precision of the localization and accurate estimation of the surface sizes of the detected defects are achieved with the advanced method, involving a denoising of the images using a thresholding of wavelet coefficients. The outcome is a significantly improved detection quality, due mainly to the advanced processing, which does not depend on the type, shape and size of the defects.

**Keywords:**

Defect detection, Flash method, Infrared images, Segmentation, Multiresolution analysis.