

# **13th International Symposium on Nondestructive Characterization of Materials (NDCM 2013)**

Le Mans, France  
20-24 May 2013

ISBN: 978-1-5108-1581-0

**Printed from e-media with permission by:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571



**Some format issues inherent in the e-media version may also appear in this print version.**

License to NDT.net  
Copyright© (2013) by the authors  
All rights reserved.

Printed by Curran Associates, Inc. (2016)

For permission requests, please contact NDT.net  
at the address below.

NDT.net  
Rheintalstr 3  
53498 Bad Breisig  
Germany

Phone: + 49 2633 4756670  
Fax: + 49 3212-1030513

[info@ndt.net](mailto:info@ndt.net)

**Additional copies of this publication are available from:**

Curran Associates, Inc.  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: 845-758-0400  
Fax: 845-758-2633  
Email: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

# TABLE OF CONTENTS

<b>THERMOACOUSTIC SENSOR FOR NUCLEAR FUEL TEMPERATURE MONITORING AND HEAT TRANSFER ENHANCEMENT</b> .....	1
<i>R. A. Ali, S. L. Garrett, J. A. Smith, D. K. Kotter</i>	
<b>NON-CONTACT AIR-COUPLED VELOCITY MEASUREMENTS IN PLANAR SAMPLES</b> .....	9
<i>Z. Lafhaj, B. Pivakowski, Q. Liu</i>	
<b>IMAGING OF BIOLOGICAL NANO-COMPOSITE PLANT CELL WALL AT THE MICRO- AND NANO-SCALES</b> .....	16
<i>S. Louyeh-Mahgoudy, B. R. Tittmann, X. Xi, J. Kim</i>	
<b>EFFECT OF MATRIX RESIN PROPERTIES ON ACTIVITY OF A MECHANOCROMIC FLUORESCENT PROBE FOR USE IN A NOVEL NON-DESTRUCTIVE INSPECTION TECHNIQUE FOR AEROSPACE POLYMER MATRICES</b> .....	24
<i>G. Georgeson, B. D. Flinn, A. Jen, S.-H. Jang, Z. Shi, R. E. Toivola, N. M. Larson</i>	
<b>CHARACTERISATION OF NATURAL FIBRE THERMOPLASTIC COMPOSITES USING ULTRASONIC LONGITUDINAL SOUND WAVE</b> .....	34
<i>A. M. El-Sabbagh</i>	
<b>ASSESSMENT OF ADVANCED ULTRASONIC AND INFRARED INSPECTION METHODS TO DETECT DELAMINATIONS AND WATER INGRESS IN COMPOSITE HONEYCOMB MATERIALS</b> .....	42
<i>D. G. Moore, C. L. Nelson</i>	
<b>OPTICAL COHERENCE TOMOGRAPHY FOR INSPECTION OF AERONAUTIC COMPOSITE PARTS</b> .....	56
<i>G. Marion, P. Passelande, H. Voillaume, B. Campagne</i>	
<b>LASER ULTRASONIC DEVELOPMENTS FOR NDT OF AERONAUTIC COMPOSITE PARTS</b> .....	61
<i>F. Bentouhami, L. Gouzerh, H. Voillaume, B. Campagne</i>	
<b>SPARSE REPRESENTATIONS OF ACOUSTIC EMISSION SIGNAL: APPLICATION TO DAMAGE ANALYSIS IN GLASS FIBER REINFORCED COMPOSITES</b> .....	67
<i>F. Boubenider, R. El Guerjouma, M. Bentahar, S. Montrésor, A. Satour</i>	
<b>ESTIMATION OF ELASTIC PROPERTIES AND DAMAGE MONITORING IN 2D WOVEN COMPOSITES USING LAMB WAVES</b> .....	75
<i>B. Lamboul, G. Bai, J.-M. Roche, G. Grail</i>	
<b>NDE OF LAP SEAMS IN COMPOSITE LAMINATE FABRIC STRUCTURES</b> .....	83
<i>E. C. Johnson, D. N. Patel, C. J. Panetta, O. Esquivel, Y. M. Kim</i>	
<b>NON DESTRUCTIVE TESTING OF FABRIC WEIGHT IN THE WEAVING PROCESS</b> .....	93
<i>Y.-S. Gloy, T. Gries, G. Spies</i>	
<b>INTERACTION OF SH<sub>0</sub> GUIDED WAVE WITH A CONICAL SHAPED POINT IMPACTED DAMAGED ZONE IN A COMPOSITE PLATE</b> .....	100
<i>D. Singh, M. Bentahar, C. Mechri, R. El Guerjouma</i>	
<b>COMPUTATION OF DISPERSION CURVES IN ELASTIC WAVEGUIDES OF ARBITRARY CROSS- SECTION EMBEDDED IN INFINITE SOLID MEDIA</b> .....	109
<i>C. Hazard, A.-S. Bonnet-Bendhia, F. Treysse, K. Long Nguyen</i>	
<b>THE EFFECT OF DIFFERENT MATERIALS ON THE PROPAGATION OF GUIDED WAVES IN MULTI-WIRE CABLES</b> .....	117
<i>R. Mijarez, A. Baltazar, G. Trane</i>	
<b>LASER ULTRASONICS AND MODE CONVERSION FOR FLAW DEPTH GAUGING</b> .....	127
<i>M. Ourak, M. Duquennoy, M. Ouafiouh, F. Jenot, F. Faëse</i>	
<b>LASER ULTRASONIC TECHNIQUE FOR LASER POWDER DEPOSITION INSPECTION</b> .....	136
<i>A. Pantano, R. Lopatka, M. Scafidi, D. Cerniglia</i>	
<b>GRAIN STRUCTURE VISUALIZATION OF AUSTENITIC WELDS BY LASER DETECTION OF GRAZING INCIDENT ULTRASONIC WAVE FIELDS</b> .....	144
<i>F. Schubert, M. Barth, B. Köhler</i>	
<b>METALLURGICAL DEFECT: MANUFACTURING OF A REFERENCE SPECIMEN FOR NDE STUDIES</b> .....	150
<i>T. Filleter, A. N. Sinclair, I. Saletes</i>	
<b>DETECTING DAMAGE TRANSITIONS IN LAMINATED COMPOSITES USING SIMULATED ACOUSTIC EMISSION</b> .....	155
<i>J. C. Duke, A. Gupta</i>	

<b>MODELING ULTRASONIC STRUCTURAL NOISE BASED ON THE MICROSTRUCTURAL PROPERTIES OF METALS IN THE CONTEXT OF NON DESTRUCTIVE EVALUATION.....</b>	<b>165</b>
<i>V. Dorval, F. Jenson, S. Chatillon, L. Ducouso-Ganjehi</i>	
<b>CHARACTERIZATION AND MODELING OF ULTRASONIC SCATTERING IN THE DIFFUSIVE REGIME USING PHASED ARRAYS .....</b>	<b>171</b>
<i>V. Dorval, A. Derode, L. Ducouso-Ganjehi, F. Jenson, T. Bedetti</i>	
<b>ATTENUATION OF PURE SHEAR-WAVES IN ANISOTROPIC MATERIALS : HOW-TO MEASURE IT FROM PLANE-WAVE ANGULAR SPECTRUM DECOMPOSITION OF THE TRANSMITTED BEAM IN AN IMMERSION TANK.....</b>	<b>177</b>
<i>B. Chassignole, X. Deng, T. Monnier, N. A. Ismaili, P. Guy</i>	
<b>HIGH TEMPERATURE PIEZOELECTRICS — A COMPARISON .....</b>	<b>185</b>
<i>B. R. Tittmann, D. Parks, S. O. Zhang</i>	
<b>EDGE DETECTION COMBINED WITH OPTICAL AND INFRARED NDT TECHNIQUES: AN AID FOR WOODEN SAMPLES WITH COMPLEX SURFACE AND SUBSURFACE DEFECTS .....</b>	<b>192</b>
<i>D. Paoletti, K. Mouhoubi, D. Ambrosini, J.-L. Bodnar, S. Sfarra</i>	
<b>TERAHERTZ TIME DOMAIN SPECTROSCOPY AND IMAGING APPLIED TO CULTURAL HERITAGE.....</b>	<b>201</b>
<i>K. Fukunaga, M. Picollo</i>	
<b>ADVANCED SIMULATION OF ULTRASONIC INSPECTION OF WELDS USING DYNAMIC RAY TRACING.....</b>	<b>207</b>
<i>E. Iakovleva, N. Leymarie, D. Cassereau, A. Gardahaut, K. Jezzine</i>	
<b>TECHNICAL EVALUATION OF ULTRASOUND PHASED ARRAY INSPECTION IN WELDED JOINTS OF AISI 304L AUSTENITIC STAINLESS STEEL .....</b>	<b>215</b>
<i>R. F. Ferreira, M. S. Motta, L. S. Gomes, M. Ogawa, A. R. Pimenta</i>	
<b>STUDY OF PROBABILITY OF THE DETECTION OF DEFECTS IN WELDED JOINTS OF THE TECHNIQUES OF MAGNETIC PARTICLE AND PENETRANT TESTING .....</b>	<b>227</b>
<i>R. F. Ferreira, R. Da Costa Teixeira, L. S. Gomes, M. Ogawa, S. P. Botega, A. B. Moreira, R. De Oliveira Carneval</i>	
<b>ADVANCES IN NON-INVASIVE TUBE INSPECTION USING PULSE REFLECTOMETRY .....</b>	<b>234</b>
<i>N. Amir</i>	
<b>BROADBAND MICROWAVE INTERFEROMETRY FOR NONDESTRUCTIVE EVALUATION.....</b>	<b>241</b>
<i>T. Lasri, K. Haddadi</i>	
<b>NONDESTRUCTIVE EVALUATION OF STEEL PLATE COATED WITH CORROSION PROTECTION PAINT UTILIZING TRANSMISSION PROPERTY OF THZ WAVE.....</b>	<b>251</b>
<i>A. Moriguchi, T. Tanaka, T. Sakagami, M. Hangyo</i>	
<b>NONLINEAR ULTRASONIC GUIDED WAVES FOR MICROSTRUCTURE CHARACTERIZATION OF HOLLOW CYLINDERS .....</b>	<b>259</b>
<i>J. L. Rose, Y. Liu, C. J. Lissenden</i>	
<b>NONLINEAR VISCOELASTIC PROPERTIES MEASUREMENTS IN COMPLEX FLUIDS USING DYNAMIC ACOUSTO-ELASTIC TESTING.....</b>	<b>267</b>
<i>C. Trarieux, S. Calle, H. Moreschi, N. Lhermite, J.-F. Tranchant, A. Poulin, M. Defontaine</i>	
<b>DAMAGE ASSESSMENT IN SOLIDS THROUGH NONLINEAR ULTRASONICS IN THE TIME DOMAIN.....</b>	<b>275</b>
<i>P. Antonaci, A. S. Gliozzi, M. Griffa, M. Scalerandi</i>	
<b>EVALUATION OF FATIGUE DAMAGE BY ANALYZING THE SCALE PROPERTIES OF NDE SIGNALS .....</b>	<b>283</b>
<i>U. Cikalova, J. Schreiber, N. Meyendorf</i>	
<b>ACOUSTIC EMISSION MONITORING OF PRECURSOR DAMAGE .....</b>	<b>291</b>
<i>J. C. Duke</i>	
<b>THERMOGRAPHY IN ANALYSIS OF WORKS OF ART: CHOICE OF THE OPTIMAL APPROACH .....</b>	<b>298</b>
<i>D. Gavrilov, R. G. Maev</i>	
<b>A MODEL FOR THE ULTRASONIC FIELD RADIATED BY AN ELECTRO-MAGNETIC ACOUSTIC TRANSDUCER IN A FERROMAGNETIC SOLID .....</b>	<b>308</b>
<i>C. Aristégui, H. Walaszek, A. Lhémy, C. Rouge</i>	
<b>PHASED ARRAY TRANSDUCER FOR NONDESTRUCTIVE TESTING OF SANDWICH HONEYCOMB: C-SCAN IMAGING, SKIN THICKNESS MEASUREMENT AND DETECTION OF DELAMINATION .....</b>	<b>316</b>
<i>H. Duflo, P. Maréchal, N. Samet, E. B. Ndiaye</i>	
<b>POLYMERIZATION MONITORING USING ULTRASOUND .....</b>	<b>324</b>
<i>H. Duflo, P. Maréchal, E. B. Ndiaye, N. Samet</i>	

<b>CHARACTERISATION OF SURFACE RESIDUAL STRESS USING HIGH FREQUENCY RAYLEIGH WAVES.....</b>	<b>332</b>
<i>M. Ourak, F. Jenot, J.-E. Lefebvre, J. Deboucq, M. Duquennoy, M. Ouafiouh</i>	
<b>SUBMERGED ARC WELDING ONLINE QUALITY EVALUATION USING INFRARED THERMOGRAPHY BASED FUZZY REASONING .....</b>	<b>338</b>
<i>Y. Laib Dit Leksir, S. Bouhouche, M. S. Boucherit, J. Bast</i>	
<b>INVESTIGATION OF CHANGE MECHANISM OF MAGNETIC FLUX DENSITY DISTRIBUTION AROUND FATIGUE CRACKS.....</b>	<b>351</b>
<i>E. C. Santos, K. Kida, J. Shimada, T. Takamatsu, Y. Izumi, H. Tanabe</i>	
<b>VARIABILITY IN CRACK DETECTABILITY DUE TO LOAD HISTORY AND STRESS STATE.....</b>	<b>358</b>
<i>N. Capella, J. C. Duke</i>	
<b>EVALUATION OF FATIGUE DAMAGE BY DIFFRACTION CONTRAST TOMOGRAPHY USING SYNCHROTRON RADIATION .....</b>	<b>364</b>
<i>D. Shiozawa, Y. Nakai, R. Miura, S. Matsuda</i>	
<b>LOCAL DEFECT RESONANCE AS A MECHANISM OF HIGHLY-EFFICIENT AND FREQUENCY-SELECTIVE ULTRASONIC THERMOGRAPHY.....</b>	<b>374</b>
<i>I. Solodov</i>	
<b>DEVELOPMENT OF NON-DESTRUCTIVE COKE THICKNESS MEASUREMENT TECHNOLOGY FOR FIRED HEATER TUBES USING INFRARED THERMOGRAPHY.....</b>	<b>384</b>
<i>Y. Morishita, M. Maekawa, T. Sakagami, J. A. Kazi</i>	
<b>BIOT WAVES IN POROUS CERAMIC PLATES : INFLUENCE OF BOUNDARY CONDITIONS.....</b>	<b>394</b>
<i>C. Depollier, A. Duclos, F. Graja</i>	
<b>IMPROVEMENT OF FLAW DETECTION WITH ULTRASONIC ARRAY PROBES IN MULTIPLE SCATTERING POLYCRYSTALLINE MATERIALS BY MEANS OF A RANDOM MATRIX APPROACH.....</b>	<b>404</b>
<i>S. Shahjahan, A. Aubry, F. Rupin, B. Chassignole, A. Derode</i>	
<b>Author Index</b>	