BRIEF RESUME OF MICHEL GRÉDIAC

Professor of Experimental Mechanics
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ADDRESS

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CITIZENSHIP

- French

EDUCATION

- 1983 : Degree of Engineering, Ecole Nationale Supérieure d'Arts et Métiers, Paris, France
- 1983 : "Diplôme d'Etudes Approdondies" in Mechanical engineering (Master), Université Pierre et Marie Curie, Paris, France
- 1984 : "Agrégation" in Mechanical Engineering
- 1989 : PhD in Mechanical Engineering, Université Claude Bernard, Lyon, France
- 1993 : "Habilitation" in Mechanical Engineering, Université de St-Etienne, France

ACADEMIC POSITIONS

- 1985-1988 : research fellow, Ecole Nationale Supérieure des Mines de St-Etienne, France
- 1988-1991 : lecturer, Ecole Nationale d'Ingénieurs de St-Etienne, France
- 1991-1993 : assistant professor, Université de St-Etienne, France
- 1994-1997 : research professor, Ecole Nationale Supérieure des Mines de St-Etienne, France
- 1997-date : professor, Université Clermont Auvergne, Clermont-Ferrand, France

HONORS AND AWARDS

- 1993 : young researcher Valentin award, French Society for Composite Materials
- 2010 : P.S. Theocaris award, European Society for Experimental Mechanics
- 2011 : M. Hetényi award, *best paper published in Experimental Mechanics*, Society for Experimental Mechanics, USA
- 2015 : B.J. Lazan award *for pioneering work towards establishing a new paradigm in materials testing coupling full-field measurements with inverse identification*, Society for Experimental Mechanics, USA
- 2016 : Best Strain Paper Fylde Prize, British Society for Strain Measurement, UK
- 2018 : Fellow of the Society for Experimental Mechanics, USA, *for visionary experimental mechanics developments based on full-field measurements and inverse identification*

RESEARCH INTEREST

- development and use of full-field measurement techniques in experimental solid mechanics
- material and structure characterization

WEBSITES

- `http://cloud.ip.univ-bpclermont.fr/~grediac/`
- `http://www.thegridmethod.net` (in connexion with [111])
- `http://www.researcherid.com/rid/H-7100-2013`
- `http://orcid.org/0000-0002-6814-1438`

EDITORIAL ACIVITIES

- 2010-date : associate editor of *Experimental Mechanics*, Springer
- 2007-date : member of the Editorial Board of *Strain, an International Journal for Experimental Mechanics*, Wiley
- 2003 : special issue of *Mécanique et Industrie* dedicated to *Identification from full-field measurements*, in French, edited by M. Grédiac, 4(6)
- 2007 : special issue of *Strain, an International Journal for Experimental Mechanics*, dedicated to Photomechanics 2006, edited by M. Grédiac and J.M. Huntley, 43(3)
- 2010 : special issue of *Strain, an International Journal for Experimental Mechanics*, dedicated to Photomechanics 2008, edited by M. Grédiac and J.M. Huntley, 46(1)
- 2011 : special issue of *Experimental Mechanics* dedicated to *"Advanced Imaging Methods"*, edited by M. A. Sutton, F. Hild, H. Jin, X. Li, and M. Grédiac, 51(4)
- 2017 : special issue of *Strain, an International Journal for Experimental Mechanics*, dedicated to Identification from full-field measurements, edited by M. Grédiac and F. Pierron, 53(5), 2017

RECENT INVITATIONS IN FOREIGN UNIVERSITIES

for seminars, short stays and/or PhD committees

- 2012 : Caltech, Pasadena, USA
- 2013 : University of Piteşti, Romania ; Loughborough University, UK
- 2014 : University of Zagreb, Croatia ; Royal Military School and Free University of Brussels, Belgium ; University of Southampton, UK
- 2015 : University of Antwerp and Free University of Brussels, Belgium ; Politecnico di Milano, Italy ; King Abdullah University of Science and Technology, Jeddah, Saoudi Arabia ; Caltech, Pasadena, USA ; Chiang Mai University, Thailand
- 2016 : Aalborg University, Denmark
- 2017 : University of Antwerp, Belgium ; Beijing Institute of Technology, Beihang University and Tsinghua University, Beijing, China
- 2018 : KU Leuven, Belgium ; Beijing Institute of Technology, Tianjin University, University of Science and Technology of China, Hefei, China
- 2019 : Tsinghua University, Beijing, Beijing Institute of Technology, Institute of Flexible Electronics and Technology of THU (Tsinghua), Zhejiang, China ; KTH Stockholm, Sweden ; TU Eindhoven, The Netherlands

EXPERT FOR FOREIGN INSTITUTIONS

- 2018-19 : foreign expert for the Danish Ministry for Higher Education and Science, appraisal and ranking of several applications at the Ministry, Copenhagen, Denmark
- 2020 : appraisal of several applications, Newton International Fellowships, The Royal Society, London, UK

TEACHING

Courses taught at the Ecole Nationale d'Ingénieurs de Saint-Etienne, France

- Maths
- Rigid body mechanics

Courses taught at the University of Saint-Etienne, France

- Mechanics of particles
- Rigid body mechanics

Courses taught at the Ecole Nationale Supérieure des Mines de Saint-Etienne, France

- Mechanics of composite materials and structures
- Computer-aided design
- Dynamics of deformable solids

Courses taught at the Université Clermont Auvergne, Clermont-Ferrand, France

- Mechanics of deformable solids
- Continuum mechanics
- Mechanics of composite materials and structures

OTHER ACTIVITIES

- founder (2003) and head (2003-2010) of the French research network "GDR CNRS 2519 : Full-field measurements and identification in solid mechanics" to support the use of full-field measurement techniques in experimental solid mechanics and facilitate collaborative work in this field across France. 45 one-day research workshops were organized between partners during this period. This network has led to 4 collaborative papers written by several partners and published in *Experimental Mechanics* (3) and in *Strain* (1).
- co-chairman of international conferences devoted to the development and to the applications of full-field measurement techniques in experimental solid mechanics :
  — Photomechanics 2006 (Clermont-Ferrand, France)
  — Photomechanics 2008 (Loughborough, UK)
  — Photomechanics 2011 (Brussels, Belgium)
- organizer of the first five-day national summer school entitled *Identification techniques from full-field measurements*, Clermont-Ferrand, France, 8-12 June 2009, 14 lecturers. This summer school has then been organized again in 2011 in Cachan, France, and in 2013 Montpellier, France, each time with nearly the same programme and set of lecturers.

GRADUATED PhD STUDENTS

C. Toukourou, B. Mohamadou, A. Benkeddad, P.-A. Paris, F. Cerisier, L. Dufort, V. Sierra-Ruiz, N. Racana, M. Muller, P. Faye, J. D. Mathias, K. S. Muhammad, M.-L. Pastor, M.-P. Moutrille, N. Promma, A. Deheeger, C. Badulescu, D. Delpueyo, M. Soudé, P. Garnier, C. Bubulinca, S. Sun, N. Barrera, P. Jongchansitto, D. Dang, M. Cheikh Teguedi, H. Boudarel, B. Odunga, S. Boukhtache

SOCIETY MEMBERSHIPS

- Society for Experimental Mechanics
- Association Française de Mécanique
- British Society for Strain Measurement

PUBLICATIONS

Books

[1] M. Grédiac and F. Hild, editors. *Mesures de Champs et Identification en Mécanique des Solides*. Hermès, février 2011. ISBN : 9782746231122, 504 pages.

[2] F. Pierron and M. Grédiac. *The virtual fields method*. Springer, 2012. 517 pages, ISBN 978-1-4614-1823-8.

[3] M. Grédiac and F. Hild, editors. *Full-field measurements and identification in solid mechanics*. Wiley, novembre 2012. ISBN : 9781848212947, 496 pages.

Refereed international journal publications

[4] M. Grédiac and A. Vautrin. A new method for determination of bending rigidities of thin anisotropic plates. *Journal of Applied Mechanics*, 57 :964–968, December 1990. Transactions of the American Society of Mechanical Engineers.

[5] M. Grédiac, A. Hachani, and A. Vautrin. Applying a quadriaxial extensometer to the strain analysis of anisotropic structures. *Composite Structures*, 17 :37–49, 1991.

[6] M. Grédiac and A. Vautrin. Mechanical characterization of anisotropic plates : experiments and results. *European Journal of Mechanics/A Solids*, 12(6) :819–838, 1993.

[7] M. Grédiac, A. Vautrin, and G. Verchery. A general method for data averaging of anisotropic elastic constants. *Journal of Applied Mechanics*, 60 :614–618, 1993. Transactions of the American Society of Mechanical Engineers.

[8] M. Grédiac. Four-point bending tests on off-axis composites. *Composite Structures*, 24 :8998, 1993.

[9] M. Grédiac. A finite element study of the transverse shear in honeycomb cores. *International Journal of Solids and Structures*, 30 :1777–1788, 1993.

[10] M. Grédiac, F. Pierron, and A. Vautrin. The Iosipescu in-plane shear test : a new approach based on displacement field processing. *Composite Science and Technology*, 51 :409–417, 1995.

[11] A. Benkeddad, M. Grédiac, and A. Vautrin. On the transient hygroscopic stresses in laminated composite plates. *Composite Structures*, 30 :201–205, 1995.

[12] M. Grédiac. The use of heterogeneous strain fields for the characterization of composite materials. *Composite Science and Technology*, 56 :841–846, 1996.

[13] A. Benkeddad, M. Grédiac, and A. Vautrin. Computing of transient hygroscopic stresses in laminated plates. *Composite Science and Technology*, 56 :869–876, 1996.

[14] M. Grédiac. On the direct determination of invariant parameters governing the bending of anisotropic plates. *International Journal of Solids and Structures*, 33(27) :3969–3982, 1996.

[15] M. Grédiac and P.-A. Paris. Direct identification of elastic constants of anisotropic plates by modal analysis : theoretical and numerical aspects. *Journal of Sound and Vibration*, 195(3) :401–415, 1996.

[16] M. Grédiac. A method for surface reconstruction from slope or curvature of rectangular areas. *Applied Optics*, 36 :4823–4829, 1997.

[17] M. Grédiac and F. Pierron. A T-shaped specimen for the direct characterization of orthotropic materials. *International Journal for Numerical Methods in Engineering*, 41(2) :293–309, 1998.

[18] M. Grédiac, N. Fournier, P.-A. Paris, and Y. Surrel. Direct identification of elastic constants of anisotropic plates by modal analysis : experiments and results. *Journal of Sound and Vibration*, 210(5) :645–659, 1998.

[19] Y. Surrel, N. Fournier, M. Grédiac, and P.-A. Paris. Phase-stepped deflectometry applied to shape measurement of bent plates. *Experimental Mechanics*, 39(1) :66–70, 1999.

[20] M. Grédiac, F. Pierron, and Surrel Y. Novel procedure for complete in-plane composite characterization using a T-shaped specimen. *Experimental Mechanics*, 39(2) :142–149, 1999.

[21] M. Grédiac, N. Fournier, P.-A. Paris, and Y. Surrel. Direct measurement of invariant parameters of composite plates. *Journal of Composite Materials*, 33(20) :1939–1965, 1999.

[22] M. Grédiac. A procedure for designing laminated plates with required stiffness properties. Application to thin quasi-isotropic quasi-homogeneous laminates. *Journal of Composite Materials*, 33(21) :2017–2040, 1999.

[23] F. Pierron, F. Cerisier, and M. Grédiac. A numerical and experimental study of woven composite pin-joints. *Journal of Composite Materials*, 34(12) :1028–1054, 2000.

[24] M. Grédiac. On the design of some particular orthotropic plates with non-standard ply orientations. *Journal of Composite Materials*, 34(19) :1665–1693, 2000.

[25] F. Pierron and M. Grédiac. Identification of the through-thickness moduli of thick composites from whole-field measurements using the Iosipescu fixture : theory and simulations. *Composites/Part A*, 31(4) :309–318, 2000.

[26] F. Pierron, S. Zhavaronok, and M. Grédiac. Identification of the through-thickness properties of thick laminates using the virtual fields method. *International Journal of Solids and Structures*, 37(32) :4437–4453, 2000.

[27] L. Dufort, M. Grédiac, and Y. Surrel. Experimental evidence of the cross section warping in short composite beams under three point bending. *Composite Structures*, 51 :37–47, 2001.

[28] M. Grédiac. On the stiffness design of thin woven composites. *Composite Structures*, 51 :245–255, 2001.

[29] L. Dufort, S. Drapier, and M. Grédiac. Closed-form solution for the cross-section warping in short beams under three point bending. *Composite Structures*, 52 :233–246, 2001.

[30] M. Grédiac, F. Auslender, and F. Pierron. Applying the virtual fields method to determine the through-thickness moduli of thick composites with a nonlinear shear response. *Composites/Part A*, 32(12) :1713–1725, 2001.

[31] M. Grédiac and L. Dufort. Experimental evidence of parasitic effects in the shear test on sandwich beams. *Experimental Mechanics*, 42(2) :186–193, 2002.

[32] V. Sierra-Ruiz, J.-F. Destrebecq, and M. Grédiac. The transfer length in concrete structures repaired with composite materials : a survey of some analytical models and simplified approaches. *Composite Structures*, 55(445) :454, 2002.

[33] M. Grédiac, E. Toussaint, and F. Pierron. Special virtual fields for the direct determination of material parameters with the virtual fields method. 1- Principle and definition. *International Journal of Solids and Structures*, 39 :2691–2705, 2002.

[34] M. Grédiac, E. Toussaint, and F. Pierron. Special virtual fields for the direct determination of material parameters with the virtual fields method. 2- Application to in-plane properties. *International Journal of Solids and Structures*, 39 :2707–2730, 2002.

[35] M. Grédiac, E. Toussaint, and F. Pierron. Special virtual fields for the direct determination of material parameters with the virtual fields method. 3- Application to the bending rigidities of anisotropic plates. *International Journal of Solids and Structures*, 40 :2401–2419, 2003.

[36] N. Racana, M. Grédiac, and R. Gourvès. Pull-out response of corrugated geotextile strips. *Geotextiles and Geomembranes*, 21(5) :265–337, 2003.

[37] M. Grédiac. The use of full-field measurement methods in composite material characterization : interest and limitations. *Composites Part A*, 35 :751–761, 2004.

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[42] M. Grédiac and F. Pierron. Numerical issues in the virtual fields method. *International Journal for Numerical Methods in Engineering*, 59 :1287–1312, 2004.

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[45] J. D. Mathias, X. Balandraud, and M. Grédiac. Applying a genetic algorithm to the optimization of composite patches. *Computers and Structures*, 84 :823–834, 2006.

[46] J. D. Mathias, X. Balandraud, and M. Grédiac. Experimental investigation of composite patches with a full-field measurement method. *Composites Part A*, 37(2) :177–190, 2006.

[47] E. Toussaint, M. Grédiac, and F. Pierron. The virtual fields method with piecewise virtual fields. *International Journal of Mechanical Sciences*, 48(3) :256–264, 2006.

[48] M. Grédiac and F. Pierron. Applying the virtual fields method to the identification of plastic constitutive equations. *International Journal of Plasticity*, 26(4) :602–627, 2006.

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[51] M. Grédiac, F. Pierron, S. Avril, and E. Toussaint. The virtual fields method for extracting constitutive parameters from full-field measurements : a review. *Strain*, 42 :233–253, 2006.

[52] J.H. Kim, F. Pierron, M. Grédiac, and M. R. Wisnom. A procedure for producing reflective coatings on plates to be used for full-field slope measurements by a deflectometry technique. *Strain*, 43(2) :138–143, 2007.

[53] J.F. Destrebecq, M. Grédiac, and V. Sierra-Ruiz. The transfer length in reinforced concrete structures strengthened with composite plates : experimental study and modelling. *Composites Science and Technology*, 67(3-4) :707–719, 2007.

[54] M. Muller, E. Toussaint, J.F. Destrebecq, and M. Grédiac. Investigation into the time dependent behaviour of reinforced concrete specimens strengthned with externally bonded CFRP plates. *Composites Part B*, 38(4) :417–428, 2007.

[55] J.-D. Mathias, M. Grédiac, and X. Balandraud. Design of composite patches to reinforce damaged wings. *AIAA Journal*, 46(1) :46–53, 2008. American Institute of Aeronautics and Astronautics.

[56] M.L. Pastor, X. Balandraud, M. Grédiac, and J.L. Robert. On the fatigue response of aluminium specimens reinforced with carbon-epoxy patches. *Composite Structures*, 83(3) :237–246, 2008.

[57] B. Paluch, M. Grédiac, and A. Faye. Combining a finite element programme and a genetic algorithm to optimize composite structures with variable thickness. *Composite Structures*, 83(3) :284–294, 2008.

[58] J. Oh, M. Cho, J.S. Kim, and M. Grédiac. A finite element formulation for based on an enhanced first order shear deformation theory for composite and sandwich structures. *Journal of Mechanical Science and Technology*, 22(5) :871–878, 2008.

[59] K.Syed Muhammad, E. Toussaint, M. Grédiac, S. Avril, and J.H. Kim. Characterization of composite plates using the virtual fields method using optimized loading conditions. *Composite Structures*, 85(1) :70–82, 2008.

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[61] J.D. Mathias and M. Grédiac. Applying the grid method to validate a numerical model predicting the transverse shear stress distribution in patched structure. *Composites Part A*, 39(8) :1194–1209, 2008.

[62] M.-P. Moutrille, X. Balandraud, M. Grédiac, K. Derrien, and D. Baptiste. Applying thermoelasticity to study stess relief in aluminium specimens patched with composite materials. *Journal of Strain Analysis for Engineering Design*, 43(6) :423–434, 2008.

[63] M.L. Pastor, X. Balandraud, M. Grédiac, and J.L. Robert. Heating of 2024-T3 aluminium specimen under fatigue loading. *Infrared Physics and Technology*, 51(6) :505–515, 2008.

[64] K. Syed-Muhammad, E. Toussaint, and M. Grédiac. Optimization of a mechanical test on composite plates with the virtual fields method. *Structural and Multidisciplinary Optimization*, 38(1) :71–82, 2009.

[65] N. Promma, B. Raka, M. Grédiac, E. Toussaint, J. B. Le Cam, X. Balandraud, and F. Hild. Application of the virtual fields method to mechanical characterization of elastomeric materials. *International Journal of Solids and Structures*, 46 :698–715, 2009.

[66] M.-L. Pastor, X. Balandraud, J.-L. Robert, and M. Grédiac. Lifetime prediction of aluminium structures reinforced with composite patches. *International Journal of Fatigue*, 31 :850–858, 2009.

[67] A. Deheeger, J-D Mathias, and M. Grédiac. A closed-form solution for the thermal stress distribution in rectangular metal/composite bonded joints. *International Journal of Adhesion and Adhesives*, 29 :515–524, 2009.

[68] M. Bornert, F. Brémand, P. Doumalin, J.-C. Dupré, M. Fazzini, M. Grédiac, F. Hild, S. Mistou, J. Molimard, J.-J. Orteu, L. Robert, Y. Surrel, P. Vacher, and B. Wattrisse. Assessment of digital image correlation measurement errors : methodology and results. *Experimental Mechanics*, 49(3) :353–370, 2009.

[69] T. Pottier, M.P. Moutrille, J.-B. Le Cam, X. Balandraud, and M. Grédiac. Study on the use of motion compensation techniques to determine heat sources. application to large deformations on cracked rubber specimens. *Experimental Mechanics*, 49(4) :561–574, 2009.

[70] M.-P. Moutrille, K. Derrien, D. Baptiste, X. Balandraud, and M. Grédiac. Through-thickness strain field measurement in a composite/aluminium adhesive joint. *Composites Part A*, 40(8) :985–996, 2009.

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[72] C. Badulescu, M. Grédiac, J.-D. Mathias, and D. Roux. A procedure for accurate one-dimensional strain measurement using the grid method. *Experimental Mechanics*, 49(6) :841–854, 2009.

[73] C. Badulescu, M. Grédiac, and J.-D. Mathias. Investigation of the grid method for accurate in-plane strain measurement. *Measurement Science and Technology*, 20(9) :20 :095102, doi :10.1088/0957–0233/20/9/095102, 2009. IOP.

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[75] X. Balandraud, G. Zhou, M. Grédiac, and N. Tessier-Doyen. Applying infrared thermography to characterize ceramic materials subjected to cyclic loading. *Experimental Mechanics*, 50(7) :979–992, 2010.

[76] H.S. Kim, M. Cho, J. Lee, A. Deheeger, M. Grédiac, and J.-D. Mathias. Three dimensional stress analysis of a composite patch using stress functions. *International Journal of Mechanical Science*, 52(12) :1646–1659, 2010.

[77] A. Deheeger, J.D. Mathias, M. Grédiac, and V. Verney. Studying the thermoviscoelastic response of the Redux 312 adhesive. Part 1 : Experimental characterization. *International Journal of Adhesion and Adhesives*, 31(2) :68–74, 2011.

[78] A. Deheeger, J.D. Mathias, and M. Grédiac. Studying the thermoviscoelastic response of the Redux 312 adhesive. Part 2 : Modeling. *International Journal of Adhesion and Adhesives*, 31(2) :57–67, 2011.

[79] C. Badulescu, M. Grédiac, H. Haddadi, J.-D. Mathias, X. Balandraud, and H.-S. Tran. Applying the grid method and infrared thermography to investigate plastic deformation in aluminium multicrystal. *Mechanics of Materials*, 43(11) :36–53, 2011.

[80] D. Delpueyo, X. Balandraud, and M. Grédiac. Applying infrared thermography to experimentally evidence martensitic microstructures in a Cu-Al-Be shape-memory-alloy single crystal. *Materials Science and Engineering : A*, 528(28) :8249–8258, 2012.

[81] D. Delpueyo, M. Grédiac, X. Balandraud, and C. Badulescu. Investigation of martensitic microstructures in a monocrystalline Cu-Al-Be shape memory alloy with the grid method and infrared thermography. *Mechanics of Materials*, 45(1) :34–51, 2012.

[82] E. Toussaint, X. Balandraud, J.-B. Le Cam, and M. Grédiac. Combining displacement, strain, temperature and heat source fields to investigate the thermomechanical response of an elastomeric specimen subjected to large deformations. *Polymer Testing*, 31 :916–925, 2012.

[83] P. Garnier, J.-B. Le Cam, and M. Grédiac. On the influence of the number of cycles on the viscoelastic properties of rubber under fatigue loading : another dimension of the Payne effect ? *Mechanics of Materials*, 56 :84–94, 2012. Elsevier.

[84] M. Grédiac and E. Toussaint. Studying the mechanical behaviour of asphalt mixtures with the grid method. *Strain. An International Journal for Experimental Mechanics*, 49(1) :1–15, 2013. Wiley.

[85] A. K. Patel, P. Michaud, H. de Baynast, M. Grédiac, and J.-D. Mathias. Preparation of chitosan-based adhesives and assessment of their mechanical properties. *Journal of Applied Polymer Science*, 127(5) :3869–3876, 2013. Wiley. DOI : 10.1002/app.37685.

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[88] M. Grédiac, F. Sur, C. Badulescu, and J.-D. Mathias. Using deconvolution to improve the metrological performance of the grid method. *Optics and Lasers in Engineering*, 51(6) :716–734, 2013.

[89] D. Delpueyo, X. Balandraud, and M. Grédiac. Heat source calculation from noisy temperature fields using an optimized derivative Gaussian filter. *Infrared Physics and Technology*, 60 :312–322, 2013.

[90] M. Soudé, B. Chevalier, M. Grédiac, A. Talon, and R. Gourvès. Studying the effect of impacts on soils reinforced with geocells. *Geotextiles and Geomembranes*, 39 :39–50, 2013.

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[92] P. Garnier, J.-B. Le Cam, M. Grédiac, S. Ababou-Girard, and M. Dubois. On the evolution of the viscoelastic properties and its microstructural/chemical origin in filled NBR subjected to coupled thermal and cyclic mechanical loads. *Polymer Degradation and Stability*, 98 :2102–2110, 2013.

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[94] S. Sun, J.-D. Mathias, E. Toussaint, and M. Grédiac. Characterizing the variance of mechanical properties of sunflower bark for biocomposite applications. *Bioresources*, 9(1) :922–937, 2014.

[95] M. Grédiac and F. Sur. Effect of sensor noise on the resolution and spatial resolution of the displacement and strain maps obtained with the grid method. *Strain*, 50(1) :1–27, 2014. Paper invited for the 50th anniversary of the journal. Wiley.

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