

Session

Room

## FRACTURE, FATIGUE &amp; LIFETIME PREDICTION (1)

A+B+C

Chair: Prof. Jean-Benoit Le Cam

10:30

A Study on the Influence of Mechanical Preconditioning on the Fatigue Behavior of Rubber Materials

*D. Juhre & M. Krause*

10:50

Influence of Thermo-Oxidative Ageing on Fatigue-Lifetime of NR

*C. Neuhaus, A. Lion & M. Johlitz*

11:10

Influence of Air and Seawater on Fatigue Behavior of Natural Rubber

*K. Narynbek Ulu, B. Huneau, E. Verron & P.-Y. Le Gac*

11:30

Effect of Antioxidants on the Fatigue Crack Growth Behavior of Filled SBR Compounds

*P. Rublon & A. Favier*

11:50

Evaluation of the Fatigue Properties of Elastomers Based on Thermomechanical Characterization Coupled to Micro-Structural Measurements

*Y. Marco, I. Masquelier, V. Le Saux, B. Huneau & P. Charrier*

## KEYNOTE LECTURE

A+B+C

Chair: Prof. Jörn Ihlemann

13:20

Modelling of Fracture in Elastomers

*M. Kaliske, K. Özenç, R. Fleischhauer & C. Steinke*

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## FRACTURE, FATIGUE &amp; LIFETIME PREDICTION (2)

A+B+C

Chair: Prof. Yann Marco

14:10 Contributions of Nonlinear Viscoelasticity on the Velocity Transition of the Crack Growth of Filled Elastomers

*Y. Morishita, K. Tsunoda & K. Urayama*

14:30 Analysis of Crack Propagation in Elastomers Based on Global and Local Characterization Methods

*S. Dedova & G. Heinrich, K. Schneider & K. Brüning*

14:50 Lifetime Prediction of Elastomers Based on Statistical Occurrence of Material Defects

*M. Ludwig, T. Alshuth, M. El Yaagoubi & D. Juhre*

## FRACTURE, FATIGUE &amp; LIFETIME PREDICTION (3)

A+B+C

Chair: Prof. Erwan Verron

15:30 Relationship Between Displacement and Force Controlled Fatigue Tests

*W. V. Mars, M. Isasi, A. Arriaga & J. Plaza*

15:50 A New Specimen for Fatigue Analysis of Cord-Rubber Composites

*A. von Eitzen, U. Weltin, M. Flamm & T. Steinweger*

16:10 Effect of Constrained Strain on Failure Behavior of Rubber Vulcanizates

*Toshio Tada, Konrad Schneider, Gert Heinrich & Masaru Ishikawa*

16:30 Initiation Mechanisms of Fatigue Cracks in Carbon Black Filled Natural Rubber

*B. Huneau, I. Masquelier, Y. Marco, V. Le Saux, S. Noizet, C. Schiel & P. Charrier*

16:50 Thermomechanical Characterization of the Basic Fatigue Mechanisms at the Inclusions' Scale

*Y. Marco, I. Masquelier, V. Le Saux, B. Huneau, P. Heuillet & P. Charrier*

17:10 Morphology of Damage Occurring During Decompression in a Hydrogenexposed EPDM

*O. Kane Diallo, S. Castagnet, J.C. Grandidier & A. Nait-Ali*

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## CONTINUUM MECHANICAL MODELS AND NUMERICAL IMPLEMENTATION (1)

A+B+C

Chair: Prof. Mikhail Istkov

08:30 Evaluating the Influence of a Multiaxial Static Preload on the Dynamic Properties of Elastomers

*A. S. Lectez, E. Verron & B. Huneau*

08:50 Temperature Dependency of a Viscoplastic Constitutive Model for Rubber with Reinforcing Fillers

*Rickard Österlöf, Leif Kari & Henrik Wentzel*

09:10 3-Dimensional Homogenization FEM Analysis of Hyperelastic Low Density Polymer Foams

*R. Shimazu, H. Yasutaka, A. Nomoto & A. Matsuda*

09:30 Parallel Rheological Framework to Model the Amplitude Dependence of the Dynamic Stiffness in Carbon-Black Filled Rubber

*T. Dalrymple, J.A. Hurtado, I. Lapczyk & H.R. Ahmadi*

09:50 The Phenomenological Behaviors of Heat Build-Up Process of Rubbers

*K. Akutagawa & S. Hamatani*

## KEYNOTE LECTURE

A+B+C

Chair: Prof. James Busfield

10:30 Applications of Stress-Strain Models to Friction of Rubber

*Alan Muhr*

Session

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## FRACTURE, FATIGUE &amp; LIFETIME PREDICTION (4)

A+B+C

Chair: Dr. William Mars

11:20

Lifetime Prediction of Elastomer Components within Gasoline Engines

*S. Rausch, M.A. Ruderer, W. Enke, A. Narváez, M. Ludwig & T. Alshuth*

11:40

Experimental Survey of Approaches to Estimate the Uniaxial Fatigue Life of Industrial Rubbers

*S. Seichter, V.-M. Archodoulaki, T. Koch, W. Fidi, A. Holzner & S. Robin*

12:00

A New Experimental Approach to Rubber Resistance Against Cutting by Sharp Objects

*R. Stoček, O. Kratina & R. Kipscholl*

## DESIGN AND APPLICATIONS

A+B

Chair: Prof. Nere Gil-Negrete

13:20

Modelling of the Rubber Relaxation Effects on the Small-Deflections Behaviour of the Seismic Isolation System RBRL

*M. Donà, G. Tecchio, M. Parolin & C. Modena, A.H. Muhr*

13:40

Biaxial Model for the Rolling-Ball Rubber-Layer Isolation System

*M. Donà & A.H. Muhr*

14:00

FE Impact Analysis of Aluminum Wheel with Inflated Tire

*S. Ishikawa & N. Nosaka*

14:20

Leak Tightness of Elastomeric Seal at Low Temperature: Experimental and FEM-Simulation

*B. Omnès & P. Heuillet*

14:40

Design, Analysis and Use of a Rubber Diaphragm for Directional Drilling

*V.A. Coveney, P.A. Kukian, D.J. Minett-Smith & D.R.H. Stroud*

15:00

Jamming of Rubber Particles

*D. Stratford Devalba, L. Botto & J.J.C. Busfield*

Session

Room

## MAGNETO-SENSITIVE, IONIC AND ELECTRO-ACTIVE ELASTOMERS

C

Chair: Prof. Leif Kari

15:40 Fractional Derivative Model for Magnetorheological Elastomers

*I. Agirre-Olabide, M. J. Elejabarrieta & A. Lion*

16:00 Optimization of Mechanical Properties of Magneto-Sensitive Elastomers by Applying Hybrid-Magnetic Fillers

*M. Klüppel & S. Aloui*

16:20 Study on the Electrical Breakdown of Dielectric Elastomer Actuator Materials

*B. Chen, M. Kollosche, M. Stewart, M.G. Cain, J.J.C Busfield & F. Carpi*

16:40 Constitutive Modeling of Magneto- and Electro-Active Rubbers by Polyconvex free Energies

*M. Itskov & V. N. Khiêm*

## STRAIN INDUCED CRYSTALLIZATION

A+B

Chair: Prof. Jean-Benoit Le Cam

15:40 Crosslink, Entanglement and Strain-Induced Crystallization of NR

*S. Toki, W. Sainumsai, K. Suchiva, L. Rong & B. S. Hsiao*

16:00 A micromechanical Model for Dynamic Strain-Induced Crystallization in Filled Natural Rubbers

*Vu Ngoc Khiêm & Mikhail Itskov*

16:20 Temperature dependence of strain-induced crystallization in natural rubber

*N. Candau, L. Chazeau, J.-M. Chenal, T. Biben, R. Laghmach, C. Gauthier & E. Munch*

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## POSTER SESSION

Foyer

17:00

Models for Filled Rubber in Simple Shear

*E. Tubaldi, H.R. Ahmadi, A.H. Muhr & J. Kingston*

Characterization of Rubber-Like Materials Considering the Baker-Ericksen Inequalities

*F.T. Stumpf & R.J. Marczak*

Modelling of Changes in Mechanical Properties of Rubber under Cyclic Loading

*J. Heczko & R. Kottner*

Characterization of Heat Sources in the Crack Tip Zone in Stretched NR and SBR Rubbers

*J. R. Samaca Martinez, X. Balandraud, E. Toussaint, J.-B. Le Cam & D. Berghezan*

Factors Affecting Fatigue Life of Cord Reinforced Rubber and the Stress Distribution Modelling under Static and Dynamic Conditions

*Yinping Tao, Emiliano Bilotti, Alan G. Thomas, James J. C. Busfield, Craig. Hayes & Christopher A. Stevens*

Quantification of the Filler Flocculation Process in Natural Rubber Melts

*J. Kadlcak, I. Kuritka, L.B. Tunnicliffe & R. Cermak*

A Novel Polymer Network Deformation Model Considers Elastomer Molecular Structure Parameters

*V.N. Solodko & A.L. Svistkov*

Experimental Investigations of Swollen Nitrile Rubber under Fatigue Loading

*M. S. Loo, A. Andriyana, J.-B Le Cam & E. Robin*

High Frequency Investigation of Elastomer Properties with Glass Spheres using Ultrasonic Spectrometer

*A. Maslak, A. Lang, J. Meier & T. Alshuth*

Effect of Swelling Level on Fatigue Lifetime of Filled Nitrile Rubber

*M. S. Loo, A. Andriyana, J.-B Le Cam & E. Robin*

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## POSTER SESSION

Foyer

17:00

Thermo-Rheological Characterization of Polyetherurethane: Parameter Optimization and Validation

*E. Ghobadi, R. Sivanesapillai, J. Musialak & H. Steeb*

Extending the Overlay Method in Order to Capture the Variation due to Amplitude in the Frequency Dependence of the Dynamic Stiffness and Loss During Cyclic Loading of Elastomers

*Z. Kareaga, T. Guraya, A. Arriaga & P-E. Austrell*

Studying Dynamic of Mechanical Behaviour of Reinforced Rubbers with a Help of a Multi-Scale Approach

*I. Ivaneiko, V. Toshchevnikov, K.W. Stöckelhuber, M. Saphiannikova, S. Westermann, F. Petry & G.Heinrich*

Analysing the Deformation of the Packer Unit from a Blowout Preventer Using Finite Element Techniques

*R. J. Windslow, A.G. Thomas & J.J.C. Busfield*

Experimental Investigation of Anisotropy of the Mechanical Properties of Reinforced Elastomeric Nanocomposites

*V.V. Shadrin, K.A. Mokhireva, L.A. Komar & A.Yu. Beljaev*

The Multilevel Method for Analyzing Heightmap Data of Nanocomposites Obtained by Atomic Force Microscopy

*N.I. Uzhegova, V.N. Solodko & A.L. Svistkov*

Estimating Strain Energy Release Rate During Blade Abrasion at Steady State Using Finite Element Analysis

*G.C. Wu, A. Mukaiyama, A.G. Thomas & J.J.C. Busfield*

Dielectric Elastomer Actuators for Colour Changing Devices

*H. Zahabi, M. Bennett, J. J. C. Busfield & F. Carpi*

Investigation of Thermal Aging Effects on the Fatigue Design of Automotive Anti-Vibration Parts

*M. Broudin, V. Le Saux, Y. Marco, P. Charrier & W. Hervouet*

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## POSTER SESSION

Foyer

17:00

Phenomenological Modelling for Viscohyperelasticity: Evolution Law Extension for Neo-Hookean Hyperelasticity

*N.H.Kröger, D. Juhre*

Cavitation Erosion in UHMWPE: A Three-Dimensional FEM Study

*Brunda Kattokola, Marc Fivel & Jean-Pierre Franc*

Development of Integrated Design System for Rubber Components

*C.S. Woo & H.S. Park*

Effects of Strain-Induced Crystallization and Filler Reinforcement on Strain and Stress Concentrations in Elastomers at Finite Deformations

*H. Khajehsaeid & S. Reese*

Experimental Research of the Damping Properties of Magnetosensitive Elastomers

*I. Petrikova, B. Marvalova, S. Samal & X. Garmedia*

Calculation Methods and Fields of Use of Multilayered Rubber-Metal Packages

*S.N. Polukoshko & V.F. Gonca*

Modelling of Magneto-Mechanical Coupling in COMSOL Multiphysics

*B. Marvalova & I. Petrikova*

The Silanization Reaction of an Organically Modified Synthetic Layered Silicate and its Use as Synergistic Filler Additive for Tire Tread Compounds

*J. G. Meier, M. Martínez, D. Julve, J. Coronas, M. Menéndez, J. Ramos & J. Pérez*

Effect of Loading Rate and Initial Density on the Mechanical Response of Polyurethane Elastomer Foams

*A. Lachhab, E. Robin, J.-B. Le Cam, F. Mortier, Y. Tirel & F. Canevet*



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CONTINUUM MECHANICAL MODELS AND NUMERICAL IMPLEMENTATION (2)

A+B+C

Chair: Prof. Michael Kaliske

08:30 Modeling Nonlinear Viscoelastic Behavior of Elastomers Using a Micromechanically Motivated Rate-Dependent Approach for Relaxation Times Involved in Integral-Based Models

*H. Khajehsaeid*

08:50 A Colloidal Elastomer Model

*M. Welsch*

09:10 Some Remarks about Numerical Integration of Microsphere Models

*Erwan Verron*

09:30 Volumetric Compression of HNBR and FKM Elastomers

*A. Ilseing, B.H. Skallerud & A.H. Clausen*

09:50 Magnetic Response of Aligned Nickel Coated Carbon Fibres in a PDMS Matrix

*D.C. Stanier, S. Rahatekar & J. Ciambella*

KEYNOTE LECTURE

A+B+C

Chair: Prof. Erwan Verron

10:30 Revisiting the Mechanisms Involved in Rubber Deformation Using Experimental Thermomechanics

*J.-B. Le Cam, J. R. Samaca Martinez, X. Balandraud, E. Toussaint & J. Caillard*

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## THERMAL EFFECTS

A+B+C

Chair: Dr. Michael Johlitz

11:20 Simulation of an AEM Rubber at the Transition Temperature and Above for Sealing Applications

*J. Lejeune, C. Brung, N. Arnault & M. Barry Maizeroi*

11:40 On the Constitutive Representation of Polymer Crystallisation in Continuum Mechanics

*A. Lion & M. Johlitz*

12:00 On the Use of a Full Haigh Diagram for Lifetime Prediction of Rubber Parts

*C. Champy, V. Le Saux, Y. Marco, P. Charrier & W. Hervouet*

## AGEING

A+B

Chair: Prof. Jörn Ihlemann

13:30 Experimental Investigation on the Consumption of Oxygen and its Diffusion into Elastomers During the Process of Ageing

*A. Herzig, M. Johlitz & A. Lion*

13:50 Experimental Characterization of the Ageing Resistance of Elastomers

*K. Reincke, M. Schoßig, S. Poser, B. Langer, S. Döhler, U. Heuert, W. Frank & W. Grellmann*

14:10 Chemical Ageing of Polymers – Experiments and Modelling

*B. Musil, M. Johlitz & A. Lion*

14:30 Weathering of NR/CR Based Rubber Vulcanizates: Investigation of Network Structure using Pulse-NMR and Temperature Scanning Stress Relaxation (TSSR) Techniques

*F. A. Nobari, M. Şen, B. Karaağaç & V. Deniz*

14:50 A Dynamic Network Model to Simulate Chemical Aging Processes in Elastomers

*C. Naumann & J. Ihlemann*

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## SWELLING, FRICTION &amp; ABRASSION

C

Chair: Prof. James Busfield

13:30 Prediction of Equilibrium Swelling of Filled Elastomers Undergoing Deformations

*A. Andriyana, S.Y. Ch'ng, V. Brulliard, E. Verron & S. Le Corre*

13:50 A Swelling Study of Process-Induced and Deformation-Induced Anisotropy of Filled Rubbers

*V. A. Fernandes & D. S. A. De Focatiis*

14:10 Steady State Rolling Simulation for Rubber with Inelastic Properties

*M. A. Garcia & M. Kaliske, J. Wang & G. Bhashyam*

14:30 Multiscale Rubber Friction Homogenization for Rough Surfaces

*K. Falk & M. Kaliske*

14:50 A New Fatigue Wear Simulation Method for Road Tyre Wear

*F. Abraham & T. Alshuth*

## AGEING &amp; ADHESION

A+B

Chair: Prof. Frank Abraham

15:30 Application of a Micro-Structure Based Model to Thermally Aged Filler Reinforced Elastomer Compounds

*J. Plagge & M. Klüppel*

15:50 Lifetime Prediction of EP and NBR Rubber Seal by Thermo-Viscoelastic Model

*K. Kobayashi, T. Isozaki, A. Matsuda, Y. Mizutani & Y. Hori*

16:10 Fracture Behavior and Thermo-Oxidative Ageing of EPDM

*C. Kartout, A. Cristiano-Tassi, G. Marque & C. Creton*

16:30 Lifetime Estimation of NR under Thermal and Mechanical Loads

*S. Ernst, U. Weltin & M. Flamm*

16:50 Adhesion of Rubber – Modelling of an Adhesion Pendulum

*S. Nitzsche & M. Kröger*

Session

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## HYPERELASTICITY

C

Chair: Prof. Alexander Lion

15:30	Development of Anisotropic Hyperelastic Model Considering Stress Softening
	<i>A. Matsuda</i>
15:50	Volume Decomposition for a Robust, Mechanics-Based, Hyperelastic Foam Model
	<i>M.W. Lewis &amp; P. Rangaswamy</i>
16:10	Precise Measurement Technique of Stress-Strain Relationship for Rubber Using In-Plane Biaxial Tensile Tester
	<i>M. Fujikawa, N. Maeda, J. Yamabe, Y. Kodama &amp; M. Koishi</i>
16:30	Performance Evaluation of Various Hyperelastic Constitutive Models of Rubbers
	<i>N. Maeda, M. Fujikawa, C. Makabe, J. Yamabe, Y. Kodama &amp; M. Koishi</i>
16:50	Free Retraction of Natural Rubber
	<i>L.B. Tunnicliffe, A.G. Thomas &amp; J.J.C. Busfield</i>
17:10	Thermo-Mechanical Characterization of Silicone Foams
	<i>P. Rangaswamy, N. A. Smith, C. M. Cady &amp; M. W. Lewis</i>

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MULLINS EFFECT

A+B+C

Chair: Dr. Shigeyuki Toki

08:40

Modelling the Dynamic Behaviour of an Automotive Bush with a Viscoplastic-Elastoplastic Model

*J. Gough, H.R. Ahmadi, A.J. Harris, J.G.R. Kingston, R. Wear, A. Kilgour & T.C. Seng*

09:00

Rebound Energy Approach to Evaluate Rubber Unloading-Reloading Process for Industrial Products with Residual Strain

*R. K. Luo & W. J. Mortel*

09:20

Modeling of Mullins Effect by Generalizing the Uniaxial Theory of a Strain Amplification Factor

*S. Gelke, M. Freund, J. Ihlemann & R. Klauke*

09:40

Thermal and Calorific Effects Accompanying the Stress Softening

*J. R. Samaca Martinez, J.-B. Le Cam, X. Balandraud, E. Toussaint & J. Caillard*

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MICRO-MECHANICAL APPROACHES

A+B+C

Chair: Prof. Manfred Klüppel

10:20 Identification of Simulation Model of Polyurethane Foam by Means of Optimization Algorithm

*D. Cirkl & T. Hrus*

10:40 Simulation of Mullins Effect and Relaxation Due to Self-Organization Processes in Filled Rubber

*H. Wulf & J. Ihlemann*

11:00 Evaluating the Simulation of Ideal Filler Reinforced Elastomers Using a Full Field Modelling Approach

*D. Sodhani, B. Stier & S. Reese*

11:20 Finite element simulation of inelastic and viscoelastic effects using a Micro-Structure Based Model for Filled Elastomers

*R. Raghunath, M. Klüppel & D. Juhre*

11:40 A Micro-Mechanical Model for Non-Linear Inelastic Behavior of Double Network Hydrogels

*İ. D. Külcü, M. Itskov & R. Dargazany*

12:00 Application of Chain Length Statistics to Modeling of Rubber Elasticity and Anisotropic Softening

*M. Itskov*

12:20 Towards Constitutive Equation for Non-Linear Mechanics of PDMS-Nanosilica

*D. Colombo, S. Cantournet, F. Lequeux, H. Montes & K. Le Gorju*