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## Dr. Jan Plagge

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### Research Experience

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- 11/2020 – current: **Postdoctoral Researcher at Bergische Universität Wuppertal, Germany**  
Computer-aided investigation of polymer-nanoparticle interaction with special focus on strain crystallization
- 10/2018 – 10/2020: **Postdoctoral Researcher at Deutsches Institut für Kautschuktechnologie (DIK e.V.), Germany**  
Execution and management of projects involving filler-polymer interaction, tribology and finite-element methods of rubber. Co-acquisition of projects
- 05/2014 – 10/2018: **PhD student at DIK and Leibnitz Universität Hannover (Summa cum Laude), Material Concepts and Modeling Group (Advisor: Prof. Dr. Manfred Klüppel)**  
Thesis title: “On the Reinforcement of Rubber by Fillers and Strain-Induced Crystallization”  
In parallel: management of several projects with industrial partners, spanning a wide range of rubber technology
- 01/2014 – 04/2014: **Scientific Coworker at Georg August Universität Göttingen**  
Theoretical analysis of semiflexible polymer networks

### Education

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- 05.2012 – 12.2013: **Master of Science in Physics at Georg-August Universität Göttingen**  
Final Grade 1.2. Focus on statistical and biological physics
- 10.2010 – 03.2011: **Erasmus Exchange Program with Université Claude Bernard Lyon 1 (France)**
- 10.2008 – 05.2012: **Bachelor of Science in Physics at Georg-August Universität Göttingen**  
Final Grade 1.4, with distinction

### Scholarships, Funding and Awards

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- 09/2019: Dissertation Award “Preis der deutschen Kautschukindustrie“ (3000 €)
- 09/2016: IRCO Best Student Paper Award, IRC 2016, Kitakyushu (Japan)

### Publications

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Since 2013, I published **12 publications** in peer-reviewed journals (11 different journals). **Citations: 149, h-Index: 7, Papers as first author: 9/12 = 75%.**

#### Selected Publications:

1. [Plagge, J.](#), & Klüppel, M. (2017). A physically based model of stress softening and hysteresis of filled rubber including rate-and temperature dependency. *International Journal of Plasticity*, 89, 173-196.
2. [Plagge, J.](#), & Klüppel, M. (2018). A theory relating crystal size, mechanical response, and degree of crystallization in strained natural rubber. *Macromolecules*, 51(10), 3711-3721.
3. [Plagge, J.](#), & Heussinger, C. (2013). Melting a granular glass by cooling. *Physical review letters*, 110(7), 078001.
4. [Plagge, J.](#), Ricker, A., Kröger, N. H., Wriggers, P., & Klüppel, M. (2020). Efficient modeling of filled rubber assuming stress-induced microscopic restructurization. *International Journal of Engineering Science*, 151, 103291.
5. Spratte, T., [Plagge, J.](#), Wunde, M., & Klüppel, M. (2017). Investigation of strain-induced crystallization of carbon black and silica filled natural rubber composites based on mechanical and temperature measurements. *Polymer*, 115, 12-20.
6. [Plagge, J.](#), & Klüppel, M. (2018). Investigation of carbon black and silica surface structure by static gas adsorption with various gases. *Rubber Chemistry and Technology*, 91(2), 509-519.
7. [Plagge, J.](#), & Klüppel, M. (2020). Micromechanics of stress-softening and hysteresis of filler reinforced elastomers with applications to thermo-oxidative aging. *Polymers*, 12(6), 1350
8. Carleo, F., [Plagge, J.](#), Whear, R., Busfield, J., & Klüppel, M. (2020). Modeling the Full Time-Dependent Phenomenology of Filled Rubber for Use in Anti-Vibration Design. *Polymers*, 12(4), 841.
9. [Plagge, J.](#), Andreas Fischer, and Claus Heussinger. "Viscoelasticity of reversibly crosslinked networks of semiflexible polymers." *Physical Review E* 93.6 (2016): 062502.
10. [Plagge, J.](#), & Klüppel, M. (2019). Mullins effect revisited: Relaxation, recovery and high-strain damage. *Materials Today Communications*, 20, 100588.

## Journal Review

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I reviewed 6 papers for the journals *Macromolecules*, *Journal of Composite Science*, *Journal of Composite Materials*, *Molecules*, *Materials Today Communications* and *Plastics, Rubber and Composites*.

## Languages

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|---------|--------------------------------|
| German  | Mother tongue                  |
| English | Fluent in writing and speaking |
| French  | Advanced in speaking           |

## Teaching Experience

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### Thesis Supervisor

2016 Supervision of one Bachelor student (2016). Topics: Measurement of strain-induced crystallization via thermography, stress and strain.

### Teaching Assistant

2020 – current (University of Wuppertal) Teaching assistant for the lecture "Mechanics and Thermodynamics"

2011 – 2014 (University of Göttingen) Teaching assistant for several lectures at the faculty of Physics (2x Electrodynamics, Analytical Mechanics, Mechanics and Thermodynamics, Advanced Mathematical Methods for Physicists)

## Conference Contributions

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### Invited Talks

1. European Community on Computational Methods in Applied Sciences (ECCOMAS) Congress 2020 (Paris), canceled due to Covid-19 outbreak.
2. Gesellschaft für angewandte Mathematik und Mechanik (GAMM) Congress 2020 (Kassel), canceled due to Covid-19 outbreak.

### Conference Oral Contribution

1. J. Plagge, A. Ricker, N.H. Kröger, M. Klüppel, "Efficient Modeling of Inelastic Effects in Filled Rubber using Load Dependent Relaxation Times", ECCMR 2019, 08.2019, Hannover
2. J. Plagge, M. Klüppel, "Measuring strain-induced crystallization of filled and unfilled natural rubber by thermography, stress and strain," PolyMerTec 2018, 06.2018, Merseburg
3. J. Plagge, T. Spratte, M. Wunde, M. Klüppel, "Thermo-Mechanical Evaluation of Strain-Induced-Crystallization of Natural Rubber Composites," TireTec 2018, 02.2018, Hannover
4. J. Plagge, M. Klüppel, "A Hyperelastic Physically Based Model for Filled Elastomers Including Continuous Damage Effects and Viscoelasticity," ECCMR 2017, 08.2017, München
5. J. Plagge, A. Lang, P. Stratmann, A. Stoll, M. Klüppel, "Verbesserung der Gebrauchs- und Verschleißseigenschaften von gummierten Walzen," DKG Jahrestagung, 06.2017, Nürnberg
6. J. Plagge, M. Klüppel, "Modeling Time- and Temperature Dependent Nonlinear Response of Filled Rubbers based on Physical Principles," ICMM 5, 06.2017, Rome
7. J. Plagge, M. Klüppel, "Quantification of Strain Induced Crystallization by Thermo-Mechanical Analysis," KHK 2016, 11.2016, Hannover
8. J. Plagge, M. Klüppel, "A New Microstructure Based Model for the Response of Filler Reinforced Elastomers Including Temperature and Rate Dependence," IRC 2016, 10.2016, Kitakyushu
9. J. Plagge, M. Klüppel, "Development of a new physical model for the response of reinforced elastomers including temperature and rate dependence," ECCMR 2015, 03.2016, Prague
10. J. Plagge, M. Klüppel, "Application of a micro-structure based model to thermally aged filler reinforced elastomer compounds," DPG Jahrestagung 2015, 08.2015, Regensburg
11. J. Plagge, M. Klüppel, "Application of a micro-structure based model to filler reinforced elastomer compounds, DPG Frühjahrstagung," 03.2015, Berlin
12. (Poster) J. Plagge, A. Jain, R. Schuster, U. Giese, M. Klüppel, "Investigation of Polymer Filler Interaction with Static Gas Adsorption and IGC," IRC 2015, 07.2015, Nürnberg
13. (Poster) J. Plagge, F. Fleck, A. Lang, M. Möwes, M. Klüppel, "Energy-Efficient Elastomers," ZFM Summer School 2014, 10.2014, Hannover

### Seminar Talks

1. J. Plagge, A. Ricker, N.H. Kröger, M. Klüppel, "Efficient Modeling of Inelastic Effects in Filled Rubber using Load Dependent Relaxation Times: The DIK model", Lifetime – Simulation Conference, 09.2019, Hannover
2. J. Plagge, M. Klüppel, "Theoretical Investigation and Quantification of Strain Induced Crystallization by Linking Thermal and Mechanical Data," International Ph. D. Seminar, 05.2017, Dresden
3. J. Plagge, M. Klüppel, "Entwicklung eines temperatur- und ratenabhängigen physikalisch motivierten Modells für verstärkte Elastomere," Arbeitskreis Stoffgesetze, 05.2016, Hannover

## Non-Academic Projects

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- 08/2019 – 10/2020: **Effective Characterization and Modelling of Elastomeric Materials for FE- - Applications** (DIK, consortium of industrial partners, running)  
Development of a test protocol to efficiently estimate material parameters for Finite-element applications. Development and implementation of FE-models.

- 08/2018 – 10/2020: **Tribology in Norms Worldwide (TriNoWe)** (DIK, publicly funded, consortium of universities and industrial partners)  
Establishment of an international norm to allow quantification of noise and wear in elastomer-metal tribology contacts (automotive braking system). Modeling of elastohydrodynamic lubrication involving surface energies.
- 02/2016 – 02/2019: **Reinforcement Mechanisms of Natural Rubber / Silica Composites** (DIK, consortium of industrial partners)  
Trying to resolve the problems in the production of energy-efficient truck tires (and similar). Measurement of silica surface properties. Modeling and measurement of strain-crystallization in natural rubber.
- 02/2015 – 02/2017 **Development of a Micromechanical Material Model for Damage in Highly Loaded Elastomeric Materials** (DIK, industrial partner)  
Setting up an analytical model for filled technical rubber.
- 09/2014 – 08/2015 **Ozone Protection of Tire Side Walls by Paraffin Waxes** (DIK, industrial partner)  
Quantifying wax migration in polymer matrices using compatibility- and surface analysis.
- 05/2014 – 12/2016 **Verbesserung der Gebrauchs- und Verschleißigenschaften von gummierten Walzen in der Druckindustrie** (DIK, publicly funded, consortium of industrial partners)  
Throughout analysis of rubber compounds used for rollers regarding mechanical, physical and thermal stability.