

## Seminar series of the Graduate School GRK 2078

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Referee: **Bilen Emek Abali**  
Associate Professor in Solid Mechanics  
Uppsala University / Sweden

Date: Tuesday, October 24, 2023

Time: 14:00-15:00h

Location: Online / ZOOM

Title: **Multiphysics Simulation of Thermosetting Polymers**

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### Abstract

Two component adhesives are a thermosetting polymer mixture achieving high strength after curing. Curing is the chemical reaction increasing the crosslinking between polymer chains and it gives the necessary stiffness to the material. Depending on the application, this process may take days in the case of environmental temperatures. Hence, it is important to predict accurately thermo-mechano-chemical processes in order to estimate the materials response occurring in reality. A reliable and validated computational approach is essential to extend fundamental research studies. We present a computational framework in order to simulate the multiphysics within the adhesive. Constitutive equations are deduced by using non-equilibrium thermodynamics and material parameters are determined by using experiments. Coupled and nonlinear equations are computed at once by using open-source packages via the finite difference method in time and finite element method in space.

B. E. Abali, J. Vorel, and R. Wan-Wendner. "Thermo-mechano-chemical modeling and computation of thermosetting polymers used in post-installed fastening systems in concrete structures". In: *Continuum Mechanics and Thermodynamics* 35 (2023), pp. 971–989.

B. E. Abali, M. Y. Yardımcı, M. Zecchini, G. Daissè, F. H. Marchesini, G. De Schutter, and R. Wan-Wendner. "Experimental investigation for modeling the hardening of thermosetting polymers during curing". In: *Polymer Testing* 102 (2021), p. 107310.

B. E. Abali, M. Zecchini, G. Daissè, I. Czabany, W. Gindl-Altmutter, and R. Wan-Wendner. "Cure Kinetics and Inverse Analysis of Epoxy-Amine Based Adhesive Used for Fastening Systems". In: *Materials* 14.14 (2021), p. 3853.

B. E. Abali. *Computational Reality. Solving Nonlinear and Coupled Problems in Continuum Mechanics*. Vol. 55. *Advanced Structured Materials*. Springer Nature, Singapore, 2017

You are cordially invited to take part in the event.

Prof. Dr.-Ing. Thomas Böhlke  
(Spokesperson of GRK 2078)