

# Diploma Thesis Review

**Student's name:** Jiří Kocáb

**Title:** Material parameters identification of rheological model of rubber matrix composite

**Submitted:** Pilsen, 2016

Statements of the diploma thesis assignment:

1. Research rheological models
2. Experimentally investigate mechanical properties of the rubber matrix composite
3. Select suitable model for the description of the investigated mechanical properties
4. Identify parameters of the material model
5. Specify applicability of the selected model and the identified parameters
6. Demonstrate obtained correspondence of the model and the real composite behaviour using numerical simulations of the experiments

## General comments:

This thesis presents a parameter identification study for a cork/rubber composite material. The author of the thesis performed various experimental tests and then He fitted a parallel network model to the test data to obtain the material parameters. The thesis consists of 7 chapters. The thesis has 71 numbered pages, the unnumbered pages are: 2 pages announcement, 1 page title page. The thesis is well-written, lot of figures, tables and equations help the reader in understanding the content. *The student has finished with all the tasks specified in the statements of the thesis assignment.*

## Technical comments:

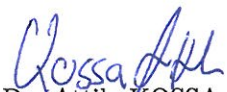
1. The thesis does not contain any photo about the investigated material. It would be great to see the structure of the composite.
2. It is unclear for the reader why did the author chose the the PNM model for this material. However, the reviewer agrees that the PNM model is a good candidate. The thesis does not present any results for other finite-strain viscoelastic material models such as the visco-hyperelastic approach. It would be great to see comparison between the accuracy/performance of the PNM model and some other finite-strain viscoelastic model.
3. The author summarizes the PNM model in general, including various ways to model the viscoelastic behavior (Table 4.1). But only one viscoelastic model (namely the strain-hardening power law) is used in the parameter-fitting procedure. The reader cannot see the benefit and validity of this model. A comparison is needed with results obtained using other viscoelastic approaches, which are listed in Table 4.1.
4. All of the experiments are so-called homogeneous tests. It would be great to see the performance of the calibrated material model for a non-homogeneous test.

## Questions for the defence:

1. What is the effect of the specimen size on the material behavior? The composite microstructure (the cork and rubber aggregates) has similar size than the thickness of the tension specimen for instance. Could you somehow quantify the error resulting from the *continuum* model approach?
2. Please demonstrate the accuracy of other finite-strain viscoelastic models (visco-hyperelastic approach with a particular hyperelastic model) and compare them to the accuracy of the PNM model. Have you performed parameter-fitting tasks to visco-hyperelastic models?
3. Are you satisfied with the results? The model predictions in some cases are very inaccurate. How can you improve the accuracy of the model?
4. Why did you use isotropic material model? Have you done any experiment to reveal the anisotropic behavior of the material?

The proposed final grade: **Excellent**

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Dr. Attila KOSSA, PhD

Associate Professor, Budapest University of Technology and Economics, Department of Applied Mechanics

kossa@mm.bme.hu