

External examiner's review of a Master's thesis

Student's name and surname: Mgr. Bohdan-Volodymyr Berezhnyy
Degree programme: Polymer Engineering
Department: Department of Polymer Engineering
Supervisor of the Master's thesis: Ing. Martin Stěnička, Ph.D.
External examiner of the Master's thesis: Ing. Petr Zádrapa, Ph.D.
Academic year: 2024/2025

Title of the Master's thesis:

The influence of the vulcanization system on the ozone stability of rubber compounds

Assessment of the Master's thesis using the ECTS grading scale:

Assessment criteria	Assessment according to the ECTS
1. Fulfilment of the assignment criteria	A – Excellent
2. Level of quality of the formal aspects of the thesis, including the level of linguistic quality	A – Excellent
3. Amount, topicality and relevance of the literature sources consulted	A – Excellent
4. Description of experiments and implementation methods	B – Very good
5. Level of quality of processing of the results	B – Very good
6. Interpretation of the results achieved and discussion thereof	B – Very good
7. Formulation of the conclusion of the thesis	B – Very good

Select the option the submitted thesis for defence and propose the following assessment:

B – Very good

Comments on the Master's thesis:

The presented master's thesis describes the influence of the amount and type of vulcanisation accelerators on ozone resistance.

Following the standard practice at our university, the thesis is divided into two main parts: theoretical and practical. In the theoretical part, the student focuses on the basic components of the rubber mixture, the principle of vulcanisation, and the process of mixing and vulcanisation. The principle of ozone ageing and the possibilities of protection against this type of ageing are also mentioned.

Overall, this section is written in clear English, with good text flow. However, I believe it would benefit from a deeper exploration of ozone aging, particularly regarding different types of rubber. In the practical section, the student concentrates on preparing materials, using the amount and type of accelerator as variable parameters for the rubber compounds. The varying ratios of accelerator to sulfur affect the lengths of sulfur bridges formed during vulcanization and may influence ozone stability. Unfortunately, the clarity of this section is diminished due to the complexity of sample descriptions and the repetition of compounds. As a result, the discussion becomes less coherent, incorporating the influence of concentration, type of accelerator, and the reproducibility of mixing. Consequently, the text becomes somewhat unclear.

Despite these shortcomings, the results obtained are interesting, and they provide a valuable overview of how the type and amount of accelerator influence the ozone aging of vulcanizates.

Questions to be asked by the external examiner of the Master's thesis:

1. A 20% strain was used in the ozone aging test. Can you demonstrate the stress in the sample at this strain and how it varies based on the type of accelerator and its concentration?
2. Do you know how network density is measured? Would this information be useful in your work?
3. Can you suggest how the study of crack initiation and growth could be studied more precisely?

In Zlín on **23. 05. 2025**

Signature of the external examiner of the Master's thesis