

## Dissertation review report

### Application of Plasma Modified Polyethylene in Composites with Natural Materials

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**Reviewer:**

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The dissertation thesis presented by Ms. Sari Panikkassery Sasidharan deals with the current topic of application of plasma modified polyethylene in composite systems with natural materials.

The aim of this work was to determine the effect of plasma modified polyethylene particles as a filler in the case of natural rubber, to determine the effect of plasma modified particles as a matrix in a composite system, to assess the effect of chemical pre-treatment coir fibers in a plasma modified polyethylene system. Further, design and optimize rotational molding for a given material system and perform an initial injection molding study for this system.

The thesis has 113 pages and is divided into 11 chapters. The chapters include all the parts that are expected from the dissertation thesis and describe the subject matter to a sufficient degree both in terms of "State of Art" and from the point of their own experiments, their evaluation, and summary.

The author expertly deals with current issues. The range of experiments is wide, all experimental methods have been appropriately selected and have a logical structure. The procedure shows the knowledge of a wide range of issues that have been addressed in the thesis. A text is not completely clear in some parts despite the logical structure of the work, thanks to two different studied areas. Goals of work have been achieved.



The most important contribution of the thesis is the connection of material research and selected technologies. The choice of materials, the design of the fibers and their chemical modification, the plasmatic modification of the polymer particles and the preparation of the samples by selected technologies and the verification the physicochemical processes in the material at the same time demonstrates excellent guidance of the supervisor. The author's publishing activities are adequate for the length of her studies.

The results of this dissertation are not only good international but also have a high potential for further research and subsequent practical application.

Submitted by Ms. Sari Panikkassery Sasidharan

**I recommend defending.**

I have the following comments and questions for my work. After their answer and successful defending, I recommend granting the Ph.D.

- 1) I consider formal deficiency that some values (pressure) were not given in SI units,
  - 2) some of the overwritten graphs are difficult to read, without quotation - figure 2.8, 2.9, 2.10,
  - 3) some references in the text do not correspond to reality - Chapter 2. 5 - Table 1 versus Table 2.1,
  - 4) uneven size of charts and images when placed side by side,
  - 5) a scale bar is not readable in small SEM images,
  - 6) lack of "phr" explanation,
  - 7) when reading it is not clear what is the quotation of one's own work and what is the work of others,
  - 8) figure 5.17 is difficult to understand, the same hatching for both materials,
  - 9) the term "biocomposite" is not explained.
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- 10) Why was hydroperoxide used for fiber treatment?
  - 11) After chemical treatment of fibers, no change in fiber dimensions is indicated in the text. However, the author refers to it in the text and claims that the aspect ratio has increased.
  - 12) Is it true that if the fibers are as a filler in the polymer, in the case of compression molding, they are not arranged in the direction of flow of the molten mixture?
  - 13) In the defense, it would be advisable to provide a clear comparison of the mechanical parameters obtained for all the sample technology used.

In Liberec, 31<sup>st</sup> March 2019

assoc. prof. Ing. Dora Kroisová, Ph.D.

