Diploma Thesis Review Report

Author: Bc. Mduduzi Blessing Kumalo

Subject: Study of the roller electrospinning with regard to roller movement

The diploma thesis consists of 64 pages and one CD, there are 45 figures and 58 references. The text is written clearly and the author provides a good overview of the concept of the current state of the electrospinning problematic, which in recent years has acquired a considerable amount of theoretical work and, moreover, experimental results. The diploma thesis focuses on the contribution to the theoretical description of the process and deals with a very current topic. The theoretical description enables an understanding and qualitative estimation that are usable for further development of nanofibrous mass production.

In spite of the overall positive evaluation of the work, I have some reservation about it. The introduction to the topic describes the history of electrospinning in extensive detail which I regard as irrelevant. The author summarizes basic, generally known properties and characteristics of polymer solutions such as non-Newtonian liquids which is important for the electrospinning process.

Regrettably, the effect of solvents or their mixture and their evaporation in the electrospinning process, which I consider as crucial, have not been mentioned at all. Especially, the evaporation of solvents through electrospinning process can bring many complications, So the validity of all the findings is limited only to electrospinning of water solutions.

One chapter describes the parameters of an electrospinning roller, whose geometry and motion is one of the decisive parameters of needleless electrospinning technology.

The Experimental part of this diploma thesis focuses on the effect of some solution parameters such as the concentration of polyvinylalcohol (PVA) water solution, presence of additives) on the spinning throughput and the number of Taylor cones, fiber diameter and morphology of nanofibers sheets.

Of course, I also have some objections. At first, there are many formal mistakes:

- Figure 1.2 (p. 16) and Figure 4.2 (p. 34) are the same, only the heading is different
- Units need to be in […]
- p.16 – reference to the patent number needs to be in a special chapter
- some references are missing
- p.22 - Figure 2.2. compares the shear rate… wrong marking
- p.23 – abbreviation \( \eta \) is not explained
- p. 23 – abbreviation “rpm“ is not explained
- p.30 – equitation 2.9 is missing
- p.30 – see figure 2.3. – "non -fibrous are, can be measured..." – irrelevant
- p.30 – throughput- unit is wrongly written
- p.33 – PVA concentration (%) – wt% or vol%?
- p.34 – ...tabulated in table 4.1, Table 4.1. is missing
- p.24 – references are given through different ways, some information is missing (p. 61: from [1] to [5])

Questions:

- p.37 – Figure 5.2. – How can you explain that a higher concentration of PVA leads to higher conductivity
- p.58 - Why is once [mg/min] and secondly [g/min/m] used as a unit for spinning performance (p. 29)
- p.46 – Figure 5.16 – How many fiber diameters were measured?
- Why was it supposed that some small concentration of natrium chloride can influence the viscosity of PVA water solution? PVA does not have any properties of a polyelectrolyte.
- p.38 – How is the slope found with a value 0.0405 and 12.485 from the Figure 5.2. and 5.3, where are the nonlinear curves?
- p.60 – How is a throughput per jet calculated? Is the number of Taylor cones known?
- How can the results of this diploma work be used in a practice?

In spite of the given objections, my rating of the work is positive. The results increase the existing knowledge about needleless electrospinning

Therefore, I recommend the diploma thesis of Bc. Mduduzi Blessing Kumalo to be the basis for nominating him for the Ing.Engineer advocacy.
I evaluate the grade to be

- C (dobře) -

Doc. Ing. Lenka Martinová, CSc
V Liberci 22.5. 2012