

PROCESSING, STRUCTURE AND PROPERTIES OF COMPOSITES BASED ON NATURAL FILLERS AND STEREOREGULAR POLYOLEFINS: ENVIRONMENTALLY BENIGN CONCEPT

Applicant:

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The thesis deals with the wood-fibre based polymer (polypropylene) composites (WPC) being presently highly actual scientific and industrial topic. The reason is that the WPC offer an interesting combination of the properties - eg. mechanical, thermal or aesthetic, etc. at rather lower weight as compared to traditional fillers like glass fibre or talc. Indeed, also the renewable origin and recycling possibilities of the wood filler are of a high interest. Unfortunately, such properties are almost untouched in the thesis and it remains only in the level of basic rheological and structural studies.

The thesis consists of 103 Pages, 82 Figures, 11 Tables and 80 References. The work is reflected by 3 journal articles (only 1 on the topic; the second in the list, Page 102 is published in the *Plasty a Kaučuk* journal, not *Pasty a Kaučuk*) and 5 conference contributions.

The main parts of the thesis start with the *Introduction* and *State of the Art*. Here, the reader learns about the advantages of the WPC production and about their more than 20 years-long industrial traditions but unfortunately is not clear how the thesis will contradistinguish from the already published works and how the field will be enriched on top. It is also not clear why the oak and pine have been selected. Also, a short paragraph discussing the WPC mechanical properties in Page 13 does not mention at all the impact strength which is the most difficult property to control in the WPC. Some info in the chapter Polypropylene is not correct eg. that the Berthelot's (not Berthelod) viscous oil found utilization in the industry; the Figure 8 is too simple for Ph.D. thesis or the unit cell of gamma crystalline modification is orthorhombic).

Next part is called the *Aims of the Work*. Particularly puzzling is the 3rd sentence - "*Prepared composites showed number of attractive properties, which offer wide range of applications.*" Please summarize during the defence.

Following part is the Experimental part describing the sample preparation and methodology used. What is here is missing is the description how was the composite homogeneity evaluated and also explanation why compatibilisator has not been used as its utilization is in the industrial WPC now necessary.

The core of the work is the part - *Results and Discussion*. Here the applicant should reflect following questions:

- Table 4 - Why the viscosity is lower as for the the nu-PP(27) as compared to PP(27)? Also relevant Page 53, last sentence - "*It means that nu-PP(27) behaves more fluid.*"
- Page 49 - line 4 from the bottom - "*If the material flows worse, the particle will act as a lubricant.*" Cannot these phenomena be related to the wood particle dispergation?
- There is no direct discussion of the difference in the rheological properties between the extracted and non-extracted filler.
- I have some doubts that only based on the Cole-Cole plot data the author can state in the last sentence on Page 65: "*...we have been able to prepare PP/WF composites without any coupling agents with sufficient adhesion between non-polar polymer matrix and polar WF.*" Please provide other proofs during the defence.

- Table 6: Can you explain why PP(27)-10CzOak possesses the crystallinity of ~83 % (btw. to express here the crystallinity with two decimal places is out of reality) and nuPP(27)-10CzOak 'only' ~59%.
- How changed the WAXS spectra of the wood after its extraction?
- The size of B-modification crystallites by WAXS are reported larger as compared to DSC. Why? Which values should be theoretically correct?

The conclusions are frequently not supported by experimental data and overall the thesis misses the relation to the final macroscopical behaviour, which is in many cases critical to evaluate the compatibility of the composites. Though I agree with the defence of the thesis and believe that the issues mentioned above will be properly tackled and completed during it.

In Zlín, 6.6.2013



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