



Reviewer's report on dissertation thesis

Student: **MSc. Hamza Mahmoud Ahmed Mahmoud Aboelanin** Academic year: **2022/2023**

University: **UNIVERSITY OF PARDUBICE**

Faculty: **Faculty of Chemical Technology**

Study programme: **Chemistry and technology of materials (P2833)**

Workplace: **SYNPO, Pardubice**

Supervisor: **Prof. Ing. Štěpán Podzimek, CSc.**

Reviewer: **Assoc. Prof. Ing. Lucy Vojtová, Ph.D.**

Doctoral thesis topic:

SYNTHESIS AND CHARACTERIZATION OF BRANCHED POLYMERS

a) Summary of the focus of the thesis

This dissertation thesis focuses on the separation and characterization of the molar mass and its distribution of different types of branched polymers. The thesis is divided into two parts – the first deals with star-branched methacrylate polymers and the second with the monitoring of the chemical composition of polyolefin copolymers.

b) Evaluation of the originality and contribution of the work

The presented thesis deals for the first time with the star-like polymer characterization via SEC/MALS/Visco technique. It was found that with longer arms the higher exponent is needed to be applied to the equation of intrinsic viscosity-based branching ratio. The distribution of arms was also calculated using ASTRA software. An interesting thing was observing the fact that star-like polymers do not affect the dn/dc compared to linear analogues. It might be used for different calculations and prediction of star-like polymer properties. In the second part, infra-red detector was applied for the high-temperature SEC for polyolefin characterization.

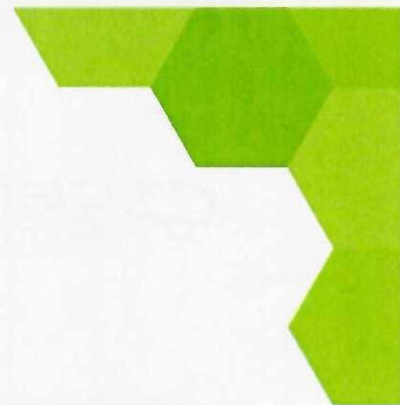
c) Assessment of the student's approach to the topic

The student synthesized and characterized various methacrylate-based polymers for determining star-like branches along with molar mass distribution. In parallel, the student characterized olefin-based copolymers and their methylene/ethylene composition via IR/SEC technique. Both calculations are novel and unique and can be used in different industrial applications.

d) Assessment of the student's readiness to solve the issue

The comprehensive theoretical part deals with different synthesis as well as characterization techniques and calculations. In the experimental work, the author provided skills in different synthesis techniques as well as knowledge in SEC/MALS/AF4 characterization. Both the theoretical part and the discussion contain high numbers of citations (over 100), which proves the





student's excellent work with current literature providing important information in the desired fields of study.

The student's readiness is excellent, the student has proven to know well the solutions to the proposed topics. The conclusions summarize the most important results of meeting the set goals, which are supported by 4 papers.

Among the minor shortcomings, I would point out some grammatical errors in English, when verbs are missing in some sentences and the sentences are then difficult to understand, there are also some typos. Moreover, the quality of some images including chemical formulas could be better. However, these minor flaws do not detract from the overall quality of the work.

Questions:


- 1) Why exactly methacrylate-based star-armed polymers and olefine-based polymers/copolymers were chosen? There are two different topics without any connection. There was no explanation of the "work motivation". Please, comment on it.
- 2) The student stated that short-chain branched PMMA was prepared by "solution-free" radical polymerization in TOLUENE as a solvent. How can I understand "solution-free" synthesis, but using the solvent toluene? It is mentioned in the summary and further in the thesis as well.

Overall evaluation of the short dissertation topic:

The thesis is filled with scientifically significant results already published in peer-reviewed first-author papers. The work indicates the fulfilment of the set results and goals to be considered suitable for the defense.

I recommend defending the dissertation of MSc. Hamza Mahmoud Ahmed Mahmoud Aboelanin with obtaining the academic title "Doctor of Philosophy" (Ph.D.).

Brno, November 28, 2023



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