

## **Reviewer's report on PhD Thesis of Mgr. Juraj ŠKVARLA:**

### **“Scattering and spectroscopic studies of polyelectrolytes and associating block copolymers”**

The research performed within PhD Thesis of Mgr. Škvarla is the original contribution to the field of classical and advanced scattering and spectroscopic studies of two types of self-assembling materials: polyelectrolytes and block copolymers.

The main tasks of the Thesis can be summarized as the study of micellization behavior of perfluorinated surfactants, self-assembly and stability of thermoresponsible amphiphilic block copolymers and counterion condensation on polyelectrolytes in aqueous solution. Mgr. Škvarla's attempt within PhD studies resulted in several papers published in appropriate impacted journals. In three of them, Mgr. Škvarla is the first author with an impressive participation (70 to 80 %), the contribution in the fourth paper is just partial (20 %); some results of current scientific work have not been published yet.

Thesis is divided into 5 parts: (i) overview, (ii) fundamentals of characterization methods, (iii) state of art, (iv) results and the overview of the published work and (v) summary and appendices. All the parts together with the material preceding the main text (abstract, contents, list of figures and tables, abbreviations, physical constants, symbols etc.) are given in the clear form.

I have several comments, questions, remarks and recommendations (listed item-by-item, not according to the importance)<sup>1</sup>:

1. Symbols in lines 3 to 5 and 7 on page xiii: could you explain the differences between molecular weight and molar mass (according to given units, everything should be just different values of molar masses).
2. All Figures and Tables should be mentioned in the text of Thesis; some of them are only listed on pages vii and viii.
3. Fundamentals of characterization scattering and spectroscopic methods are described in details; however other (sometimes indispensable) techniques are not adequately described. Despite of the fact that Mgr. Škvarla performed within the Thesis selected scattering and spectroscopic techniques, these techniques provide unambiguous results only when combined with other methods. Therefore, they should be shortly described in Chapter 2.

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<sup>1</sup> Examples of existing typing errors are not included in the review.

4. Chapter 3, State of art. To make the text more comprehensible for the reader, more relevant references should have been given. One example: the sentence on page 27 “Thermoresponsible polymers are used for example for biomedical applications including drug delivery, tissue engineering, gene delivery, etc.“ should be referred. Some abbreviations are not in this part explained, such as: C12TABr, C16TABr, C16TaBr on page 29.
5. Atomic force microscopy (AFM) is very popular and useful method e.g., for the characterization of self-assembled macromolecular systems. The size and shape of systems below and above LCST are very well detectable by AFM. Did you use AFM for the characterization of your systems?
6. The bibliography should be presented in the consistent form (letters, name and journal abbreviations, punctuations, etc.).
7. Many important details of Thesis are given as attachments in the form of full-text papers (Appendix A to C) and the text in Chapter 4 (Results) is too short and hard to understand. The reader has to browse permanently through the text of Thesis which is distracting. Moreover, the part 4.5 (Paper 4) is not accompanied by the full-text of relevant paper at all. (Chapter 4.6 describing unpublished results in the comprehensible form is the positive exception of Chapter 4).
8. Summary (Chapter 5.1) should be more specific and accurate, not just general expressions, like: “Many new materials do not behave as we expect. Each of the materials I studied was something specific and although the same methodology was used to a large extent, the methods of the experiments themselves and of their evaluation had to be very different.”

In spite of the fact that the Thesis contains the imperfections listed above, they are of technical and stylistic character. It is necessary to emphasize that Mgr. Škvarla achieved valuable original results published in recognized journals.

#### **Conclusion:**

**I would like to state that Mgr. Juraj Škvarla met all legal requirements relating to Doctoral degree graduates. I recommend this Thesis for his PhD defence and as a base for awarding of the candidate by the degree of Doctor of Philosophy.**