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**Review to PhD Thesis**

by MAŁGORZATA WOJTCZAK-MICHALSKA

at CENTRE OF MOLECULAR AND MACROMOLECULAR STUDIES, POLISH ACADEMY OF SCIENCES,  
on “THE INFLUENCE OF CHEMICAL COMPOSITION AND NUCLEATION ON ALIPHATIC-AROMATIC  
COPOLYESTERS’ CRYSTALLIZATION”

**To whom it may concern**

The author Małgorzata Wojtczak-Michalska elaborates in her PhD thesis over more than 100 pages on a range of unique aliphatic-aromatic copolyesters. The **originality of the thesis and its main contributions** are that no previous reports could be found to exist and that for the first time properties like the crystal structure and formation are determined. The careful test results together with critical evaluations by a deeper scientific understanding certainly add to the further developing knowledge in the fields of copolyesters, especially of aliphatic-aromatic nature, and their crystalline morphology development. Thus, the study is a very valuable contribution, which in part has already been published, and further articles are foreseen in related peer-reviewed journals, too.

The dissertation is properly **structured and balanced** with a 2-page introduction as opening, about 30 pages of literature review about (co-)polyesters and (co-)polymer crystallisation, 2-page summary of objectives, 15 pages of a materials and methods section, and over 50 pages of results and conclusions.

A comprehensive and detailed **literature review** is presented in the first chapter related to the state-of-the-art knowledge for the thesis subjects, i.e. crystallisation analysis as well as homo- and hetero-nucleation behaviour comparing some additives to self-nucleation.

The raised **objectives and aims** on page 35 have largely been met and achieved, so that important structure-processing-property relations and design principles are known for possible future studies of such materials.

A **thorough investigation** on the crystal structure and crystallisation behaviour in relation to comonomer sequence distribution is presented for variations of chemical compositions using aromatic contents from 10-90%. The results are also compared to data and behaviour collected for commercial copolyesters with similar molecular structures.

A **range of methods** was applied and mastered to a very high level, e.g. atomic force microscopy (AFM), differential scanning calorimetry (DSC), nuclear magnetic resonance spectroscopy (NMR), polarized light microscopy (PLM), synchrotron small- and wide-angle X-ray scattering, and small-angle light scattering (SALS).

In the appendix even a short **section on biodegradation** is presented, which points out and examines some key issues for the polymer materials life-cycle.

A substantial list of presentations, posters, patents, publication and further drafts clearly demonstrates the **output and dissemination** of the results as well as the high international relevance and standard of the contribution.

There are **only very few improvements** that I suggest the author should consider for the Thesis or the presentation. Only few language mistakes in foreign English language should be corrected, e.g. *Unfortunately, the obtained polymers were* on page 2, *Nitrogen<sub>t</sub>* on p. 57, *a composting trials<sub>s</sub>* on page 110, etc. There also seem to be some very recent interesting studies on aliphatic-aromatic copolyester design by Rastogi et al. from TU/e Eindhoven to consider for latest inclusion in the literature review.

In summary, I hereby conclude that this Thesis is in my view **fully suitable for awarding the PhD degree** to Małgorzata Wojtczak-Michalska and especially also with some high distinction in order to recognise the great work and achievements of this thesis.

Date: **April, 17th 2015,**



Signature: **Dr.-Ing. Dietmar W. Auhl**

*The undersigned Assistant Professor (Univ. Docent) Dr.-Ing. Dietmar Auhl hereby declares that the knowledge and experience of the applicant described above constitute a sufficient basis for the preparation of a dissertation by the applicant.*