70p8 - Report (2014/2015)

**Influence of processing additives to the sensitivity of PLA degradation/Vliv zpracovatelských přísad na sensitivitu PLA k degradaci**

*Ass.Prof. Stephan Laske,*

*Ing. Alena Kalendová, Ph.D., doc. Mgr. Marek Koutný Ph.D.*

The research was concentrated on Influence of processing additives to the sensitivity of PLA degradation. The project is planned for 2 years (in 2014/2015 project 70p8). In accordance with the first experimental period (from 1. 9. 2014 - 31. 8. 2015) these research steps were completed:

1. Preparation of PLA/additive mixtures – I. Preparation of PLA/Additive mixtures with different additives in semi-industrial twin-screw extruder
2. Preparation of PLA/additive films
3. Characterization of modified PLA properties (Biodegradability, Rheology, Structure)
4. Publication of results, organization of lectures

*The resources of the project supported following visits of PhD, Master students and academic staff from Tomas Bata University in Zlin (TBU-FT) in Montanuniversitaet Leoben (MUL-KV):*

4.10.-9.10.2014 Marek Koutný – academic staff, detail scheduled the experiments and split sub- tasks. Next selection of suitable materials for testing. Lecture: Characterization Methods of Biodegradable Polymers

4.10.-9.10.2014 Silvie Pekařová – Ph. D. student, participation on the planning of the work progress of the project. Futher selection of suitable materials for testing and finding their suppliers.

6.10.-11.10.2014 Alena Kalendová – academic staff, during the stay at MUL-KV was detail scheduled the experiments and split sub- tasks. Further, it was processed and transmitted data for modeling. Next the lecture Polymer/Clay Nanocomposites.

27.11-4.12.2014 Petr Stloukal – academic staff, preparation of PLA/Additive mixtures. Next lecture: Interrelation between photooxidation and biodegradation of selected polyesters.

27.11-4.12.2014 Silvie Pekařová – Ph. D. student, preparation of PLA/Additive mixtures with selected additives.

27.11-4.12.2014 Martin Seidl – master student, acquaints with the cooperation partner institution and team partners. Participation on the preparation of PLA/Additive mixtures with selected additives.

20.3.-25.3.2015 Marek Koutný – academic staff, control and correction of planned activities of project.

Next TBU FT presentation.

20.3.-23.3.2015 Petr Stloukal – academic staff, prepared PLA/Additive mixtures characterization, participation on the control and correction of planned activities of project. Next presentation: The influence of a hydrolysis-inhibiting additive on the degradation and biodegradation of PLA and its nanocomposites.

3.-6.8.2015 Silvie Pekařová – Ph. D. student, measurement and analyzing the rheological properties of PLA/Additive mixtures.

3.-6.8.2015Jana Šerá – Ph. D. student, tours of Montanuniversität, its equipment and facilities. Next measurement of rheological properties of PLA blends and then evaluation of obtained results. Next participation

on the preparation, measurement and evaluation of DSC.

3.-6.8.2015 Alice Tesaříková – Ph. D. student, participation on the consultation, DSC measurement and evaluation of the data obtained for PLA/Additive samples.

3.-6.8.2015 Lukáš Paták – master student, tours of Montanuniversität, its equipment and facilities. Next participation on the consultation, DSC measurement and evaluation of the data obtained for PLA/Additive samples.

*Supported visits of PhD student and academic staff from Montanuniversitaet Leoben (MUL-KV) in Tomas Bata University in Zlin (TBU-FT):*

07. - 21. 04. 2015 Julia Roitner – master student, tours of Tomas Bata University, its equipment and facilities. Futher preparation and measurement of biodegradability of PLA/Additive mixtures. Next GPC measurement of stabilized samples.

07. - 21. 04. 2015 Magdalena Habicher – master student, tours of Tomas Bata University, its equipment and facilities. Next participation on the preparation and measurement of the biodegradability of PLA/Additive mixtures. Futher GPC measurement of stabilized samples.

*Outputs*

***Master Thesis***

Martin Seidl. Příprava polymerních směsí s kontrolovanou dobou životnosti a testování jejich biorozložitelnosti, master thesis, UTB FT, Zlín, 2015

***Papers***

Stloukal, P., Pekařová, S., Kalendova, A., Mattausch, H., Laske, S., Holzer, C., Chitu, L., Bodner, S., Maier, G., Slouf, M., Koutny, M.: Kinetics and mechanism of the biodegradation of PLA/clay nanocomposites during thermophilic phase of composting proces (2015) Waste Management. Article in Press.   
  
Stloukal, P., Kalendova, A., Mattausch, H., Laske, S., Holzer, C., Koutny, M.: The influence of a hydrolysis-inhibiting additive on the degradation and biodegradation of PLA and its nanocomposites (2015) Polymer Testing, 41, pp. 124-132.

***Presentations:***

Stloukal P.: The influence of a hydrolysis-inhibiting additive on the degradation and  
biodegradation of PLA and its nanocomposites, 03/2015, MontanUniversitaet Leoben, Leoben, Rakousko.

All the main goals of the project for year 2014/2015 have been achieved. The first phase of project has several outputs: 1 master thesis, 2 papers in journal (international), 1 presentation. Overall the first phase of project may be evaluated as very successful, from the viewpoint of link-up of new contacts, student experiences and outputs.

*Ing. Alena Kalendová, Ph.D.*