

Review of Habilitation Thesis

Thesis title: “Design of advanced functional polymeric materials from environmentally benign methodologies”

Author: Fatima Hassouna , PhD.

Reviewer: prof. Ing. Mohamed Bakar, Ph.D.

The habilitation thesis entitled “Design of advanced functional polymeric materials from environmentally benign methodologies” deals with the preparation and properties evaluation of high performance polymeric materials using eco-friendly methodologies.

The habilitation thesis gives an outputs of the long-term research of Dr. Hassouna in relation with the development of new polymeric materials with high performance properties, considering the crucial aspect of environmental protection.

The main attention was paid to the preparation of the brittle biodegradable polylactide (PLA) and its modification by using low molecular biobased plasticizers aiming at improving its fracture toughness. In addition, polymer-based nanocomposites were investigated using waterborne systems instead of solvents.

The thesis is divided into three chapters: a short introduction presenting the drawbacks of petroleum-based materials and their replacement by environmentally friendly materials. The preparation of high performance polylactide by reactive extrusion, followed by the study of their thermo-mechanical recycling is presented in the second chapter, while the last chapter is devoted to nanocomposites based on core-shell nanoparticles combined with cellulose nanocrystals, nanocomposites containing reduced graphene oxide as well as those prepared with polyaniline and polystyrene latex nanoparticles. Dr. Hassouna focused on environmental aspects by replacing the solvent-based systems by water-borne ones or free-solvent processes and the use of biodegradable polymers leading to polymeric materials with improved performance properties.

The thesis is based on 25 articles published in scientific journals with high impact factors (12 articles were devoted to polylactide). The task of the reviewer is thus facilitated by the successful evaluation of all articles presented to the strict review procedures.

However, the general relationship between the 2 chapters on PLA and nanocomposites is not clearly indicated. This should be presented during the habitation defense.

It should be noted, that the habilitation thesis is written in an understandable level of English and the results are presented in a clear and transparent way. The thesis investigates current and essential topics such as environmental protection and polymer nanocomposites.

In my opinion, the thesis presented by Dr Hassouna meets all the scientific requirements related to habilitation at Institute of Chemical Engineering (University of Chemistry and Technology, Prague).

To further highlight the quality and interest of the thesis, I recommend that you discuss the following questions during the habilitation defense:

1 – What would be the general application of the modified (plasticized) polylactide?.

Would you consider using a plasticizer in combination with nanoparticles to further enhance the properties of PLA (through 2 different toughening mechanisms)?;

2 – Would consider to use different nanoparticlesin (ex. Nanofaibers) in order to further improve the tensile properties and impact strength of the matrix?;

3 – Could You please summarize briefly the general contribution of the present thesis (your contribution) to the polymer science and technology?.

It should be noted that these questions and comments do not in any way diminish or deny the very good level of the habilitation thesis.

Based on the above comments and overall scientific achievement (25 papers published in scientific journal with high impact factors), the habilitation thesis is rated positively and therefore, I recommend awarding the title of Associate Professor ("Docent") to Dr. Fatima Hassouna.

Starachowice, 26. 08. 2019

prof. Ing. Mohamed Bakar, PhD