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Graz, 30th July 2012

Title of the thesis: **Bioartificial Polymeric Materials with a Latent Application in Medical Field**

Name of PhD student: **MSc. Andrés Bernal Ballén**

The presented thesis entitled "**Bioartificial Polymeric Materials with a Latent Application in Medical Field**" was written by **Andrés Bernal Ballén** within the scope of the doctoral study program "Chemistry and Materials Technology". The doctoral thesis is elaborated in English language using the integrated-articles format. The written work consists Abstract in English and Czech language, the list of Figures and Tables, the list of Abbreviations and Symbols, Publication Output and Author's Contribution, Introduction, Theoretical Background, Aims of the Work, Methodology, Finding Synopsis, Closing Remarks, References, Curriculum Vitae, and 3 Framing Publications enclosed in Appendix.

The investigation described in the submitted thesis contributes to the development of bioartificial polymeric materials with the latent medical application. The main studied polymers were poly(vinyl alcohol) (PVA), PVA/Poly(vinyl pyrrolidone) blend, and PVA/Collagen bi-layer film composite.

First publication reports the negligible effect of microwave irradiation for 20 min on the stability of PVA dissolved in Ethylenglycol. It was concluded that the microwave assisted heating of PVA in Ethylenglycol solution can be considered as the suitable form of the polymer processing.

Second publication describes thermal and mechanical properties, swelling and solubility behavior of solution casted films prepared by blending of Poly(vinyl alcohol) and Poly(vinyl pyrrolidone). The modification of PVA/PVP blends by Lactic acid (LA), used as the plasticizer, and Glutaraldehyde (GA), 4, 4'-diazido-2,2'-stilbenedisulfonic acid disodium salt tetra-hydrate (DAS), used as the crosslinker agents, was proposed as the promising way to prepare polymer blend films for the medical applications.

Third publication proposes the combination of two film layers based on the plasticized PVA, and the plasticized Collagen. The resulted bi-layer film composite proposes the unique mechanical and viscoelastic properties that were not reachable by the single polymer film.

The required **aims** of the dissertation work were fully **accomplished**, which actually manifest the submitted dissertation work and three published per-reviewed publications.


The dissertation work is clear and compendious written, the literature for the review has been adequately chosen and elaborated.

Questions:

1. How can be the feature of two melting peaks, in the case of the fusion of PVA with GA in HCL, explained (page 43, Fig. 11)? Why did this phenomenon not occur in the case of the fusion of PVA, GA and LA?
2. How has been the adhesion between PVA and Collagen layer tested? Please, assess at least theoretically peel test, if it could be the suitable method to determine adhesion between PVA/Collagen film layers.
3. For Ph.D. defense, it would be interesting, discuss all possibilities how can be the glass transition temperature (T_g) determined by DMA (from E' , E'' , and $\tan\delta$) and DSC (mid-point...) analyses. Moreover, the theory behind DSC and DMA methodology could be also described.

Suggestion: The presented bioartificial polymeric films have a potential for using in the medical area as materials for tissue regeneration or reparation. Their physical properties were considered to be advanced in contrast to the common materials because of the performed chemical and physical modifications. However, it would be helpful to assess viscoelastic properties directly in the fluid environment similar to the body environment conditions. Moreover, the determination of viscoelastic properties under the moisture atmosphere could help to find the optimal concentration of the crosslinker agent for PVA.

Finally, it can be summarized that reviewed PhD thesis fulfills all preconditions for its consideration as “acceptable”. On the basis of that, **I recommend MSc. Andrés Bernal Ballén for awarding of Ph.D. degree** after successful defending of his work.

Sincerely yours, 
Adriana Gregorova, Ph.D.