Water Absorption and Electric Conductivity of Polymer Blends for Coated Biosensor Films

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Functional coatings which consist of different polymeric components are suitable for various applications such as active films of biosensors, adhesives, or coatings for organic electronics. With regard to biosensors, polymer blends are of great interest as an immobilization matrix of an active component in coatings.

The uptake of water from ambient air has an impact on the operating properties and can lead to degradation of the active film layer in the biosensor or even to loss of functionality. As a result, the performance of the device is negatively affected. Gaining a fundamental understanding of water absorption in these mixtures is therefore essential to provide stability and functionality during storage.

In this research, the electric conductivity of polymer-composite matrices was analyzed and their water sorption measured gravimetrically. The experiments displayed a great dependency between conductivity and composition as well as exposure to high relative humidity. Therefore, the subsequent goal is to determine the water uptake of polymer blends and describe it with a suitable approach. Hereto, a modified Flory-Huggins model will be introduced which can predict the sorption behavior of the composite matrix from measurements of the pure component data [1]. The obtained results will be related to the electric conductivity measurements of the composite matrix and linked to the loss of functionality. With this work, biosensors might meet the demanded requirements more easily and devices with improved performance and greater storage stability could be designed.

Please consider this topic for an oral presentation.

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References

[1] S. Kachel, P.Scharfer, W.Schabel, Chem. Eng. Process. 68 (2013) 45-54.