BARRIER AND THERMAL PROPERTIES OF BIOBASED PACKAGING MATERIALS FOR FOOD APPLICATIONS

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Although the interest in biobased plastics is growing, the lack of knowledge of a lot of stakeholders in the Flemish and European food industry regarding these new materials and their possibilities currently hinder their introduction onto the market. In contrast, a lot of research in the field of biobased plastics has already been performed, but the findings of these studies do not reach the companies or they are too narrow or too fundamental for immediate implementation. This research contributed to decreasing the knowledge gap concerning biobased plastics among the different stakeholders within the food industry. Information was obtained regarding biobased food packaging materials, from lab scale to industrial scale. The barrier and thermal properties of available biobased materials were characterized and possible strategies to improve these properties were summarized and tested. Furthermore, the performance to guarantee the shelf-life was tested (storage tests) and materials were tested in a production environment.

Characterization tests clearly showed that biobased materials with a wide range of properties (barrier and thermal) are available but that, just as for conventional oil-based materials, multilayers are necessary to provide the high barrier requirements for certain applications. The performed storage tests clearly showed the potential of these new packaging materials, also for modified atmosphere packaging (MAP), even when materials with a lower barrier were used, but they also showed that a case-by-case approach is needed and that the performance of a biobased packaging material is very product specific. Regarding thermal properties, tests with flexible cellulose-based films showed that these materials indeed possess a good heat resistance and applications with exposure to higher temperatures are possible. However, storage tests revealed that the hydrophilicity of these films (despite the moisture barrier coating), and to a lesser extent the weak seal, might limit the range of applications for these kinds of films. Tests with some rigid materials showed that PHB already has good intrinsic thermal properties and that stereocomplexation of PLA results in a material which can be used for high heat applications. Other strategies only had limited impact on the thermal properties of PLA and PHB, although a chain extender such as Joncryl® had a positive effect on the thermal degradation during processing of PLA and a nucleating agent such as Hyperform HPN® had a positive effect on the brittleness of PHB.

Topic: Applications