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Enhanced barrier for PET-bottles by combination of interior and exterior plasma-assisted coatingKarim Bahroun¹, Walter Michaeli¹, Friederike v. Fragstein¹¹Institute of Plastics Processing, Aachen, Germany

bahroun@ikv.rwth-aachen.de

Even though PET-bottles gain more and more market shares one crucial point is their insufficient permeation barrier. To overcome this disadvantage and to extend the shelf-life of sensitive beverages like beer, carbonated soft drinks or fruit juices, microwave enhanced plasma polymerization is a well known and one of the most effective techniques to create permeation barrier coatings for plastics [1, 2]. The coating is either deposited on the interior or exterior of the bottle. Typically barrier improvement factors (BIF) around 4 can be achieved. A combination of both techniques leads to a significant increase in BIF (up to 16).

In the presented studies a new coating plant is realized, which allows deposition of barrier coatings on the interior and exterior of hollow bodies by means of a PECVD process. Focus was set mainly on the process chamber design concerning easy bottle handling and easy adaptation of the chosen concept for large scale production of coated PET-bottles. As layer forming precursors C_2H_2 and HMDSO are used and correlations between the process parameters, barrier effect and coating homogeneity were investigated. If non optimal process parameters are chosen, only the neck or the bottom of the bottle is coated. The closer the process parameters are to the optimum, the more the whole bottle is covered with the coating. A preliminary optimization regarding high BIF values using a 28 g PET bottle was carried out as well.

The cycle time is not yet at a competitive value for an economically efficient use but conditions are favorable to reduce the cycle time. Transferring the prototype to a rotary plasma coating machine in combination with an optimization of the vacuum system as well as further process optimization will help to reduce the cycle time. Hence the technology enables applications for even more sensitive goods.

References

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Keywords

PECVD

barrier coating

PET-bottle

permeation