EuroSciCon

3rd Edition of International Conference and Exhibition on

Polymer Chemistry

March 26-28, 2018
Vienna, Austria

A. Blanchard et al., Polym Sci, Volume 4
DOI: 10.4172/2471-9935-C1-008

EFFECT OF HUMIDITY ON MECHANICAL, THERMAL AND BARRIER PROPERTIES OF EVOH FILMS

A Blanchard*, **F Gouanvé** and **E Espuche**
Ingénierie des Matériaux Polymères, Université de Lyon, France

Ethylene-vinyl alcohol (EVOH) copolymers are semi-crystalline materials composed of hydrophobic segments of polyethylene (PE) and hydrophilic segments of polyvinyl alcohol (PVOH). Due to its high barrier properties to gases, hydrocarbons and organic vapours at drying state [1], EVOH is more and more used in food packaging applications, allowing to extend the life span of the products [2]. Nevertheless, the major disadvantage of EVOH is its moisture content sensitivity that causes a significant decrease in the barrier properties in high relative humidity environments [3].

The main objective of this study is to get a better understanding of the mechanism of water sorption molecules in these copolymers determining the consequences on the mechanical, thermal, water and oxygen barrier properties. Consequently, these properties were analysed at several water activities (a_w) ranging from 0 to 1 on films elaborated from a 32% ethylene containing copolymer with a crystallinity of 40%.

Water vapour sorption behaviour, corresponding to a BET II sorption isotherm, reveals the sorption of water molecules on polar sites (Langmuir contribution) at low activities and the formation of water clusters at high activities [4].

GAB modelized isotherm[5] combined with the use of the clustering theory from Zimm & Lundberg[6] underline the existence of a critical activity close to 0,5 corresponding to the presence of one water molecule linked every nine PVOH amorphous units. A strong modification of the properties was observed starting from this critical point, showing how important is the understanding of the water sorption mechanism and the consequences on the properties.

References:

1. K. Khanah Mokwena, J.Tang, Food Science and Nutrition, 2012, Vol 52, 640-650
2. J.M Lagaron, E. Giménez, B. Altava, V. Del-Valle, R. Gavara, Macromolecular Symposia, 2003, Vol 198, 473-482
3. Z. Zhang, I.J. Britt, M.A. Tung, Journal of Applied Polymer Science, 2001, Vol 82, 1866-1872
4. D. Cava, L. Cabedo, E. Gimenez, R. Gavara, J.M. Lagaron, Polymer Testing, 2006, Vol 25, 254-261
5. S. Basu, U. S. Shivhare, A. S. Mujumdar, Drying Technology, 2006, Vol 25, 917-930
6. J.L. Lundberg, Pure and Applied Chemistry, 1972, Vol 31, 261-281.

Biography

A. Blanchard , in the final year of his phD, his researches taking place at the IMP laboratory (Ingénierie des Matériaux Polymère) at Villeurbanne (France) are focused on a FUI national project in collaboration with several industrial partners (Polyone, Leygatech, Bobino) and scientific centres (CTCPA, CNAM). This project named NOXY II, is dealing with the improvement of the barrier properties of EVOH films for food packaging applications, in order to extend the life span of the products.

anthony.blanchard@live.fr