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## **Temperature-dependent Oxygen Permeation through PET/MXD6-Barrier Blend Bottles with and without Oxygen Absorber**

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### **Abstract:**

The oxygen permeability of PET bottles has a significant influence on the shelf-life of beverages that are sensitive to oxygen. To reduce the permeability, PET is blended with barrier materials like MXD6 (MXD6 is a mainly aliphatic polyamide resin which contains meta-xylylene groups). The aim of this study was to investigate the temperature dependence of oxygen permeation through PET/MXD6 blends. The oxygen content inside water filled PET/MXD6-blend bottles with 2, 5 and 8% wt. of MXD6 was determined at 5, 23, 38, and 55 °C. The MXD6 was applied both purely and with a catalyst that is enabling it to work as an oxygen absorber. The results were compared to PET bottles not containing MXD6. The oxygen partial pressure inside the bottles was measured as gaseous oxygen using an optical-chemical sensor. The activation energy of oxygen permeation was calculated to be in the range from 32.8 kJ/mol for PET bottles without MXD6 and up to 43.4 kJ/mol for PET bottles with 8 wt-% for the passive barrier of MXD6. In the barrier PET bottles with MXD6 in combination with a catalyst, the oxygen content in the water-filled PET bottles remained up to 0.2 mg O<sub>2</sub>/L dissolved oxygen for a period of 6 months, depending mainly on the MXD6 concentration. This range was consistent for all applied temperatures. These data serve as a basis for the prediction /calculation of oxygen permeability of PET barrier materials at different temperatures and further for developing a standardization of oxygen absorber characterization concerning absorber kinetics and oxygen barrier.

Key-words: PET bottle, oxygen absorber, oxygen permeation, activation energy, MXD6