Gas Sorption in Poly(Lactic Acid)

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Poly(lactide) polymers (PLA) have received increasing attention in the last decade due to their natural biodegradability. They have been used since 1970s for biomedical and pharmaceutical applications, but the only recently the technology for large scale fabrication has been fully developed, making PLA available at low cost for innumerous other applications. In addition to being thermoplastic, biodegradable, compostable and produced from annually renewable feedstock, PLA show mechanical and barrier properties similar to synthetic polymers that have been long used for food packaging, like poly(styrene) (PS) and polyethylene terephthalate (PET).

The objective of this work is to study the mechanism of gas/vapor solubility in Poly(Lactic Acid) (PLA) and to provide some insight on the effect of the temperature conditioning on the polymer film. For that purpose the solubility of carbon dioxide, oxygen, nitrogen, ethylene and water vapor in Poly(Lactic Acid) (PLA) in temperature range from 283 to 313 K and up to 5MPa, was measured using a Quartz Crystal Microbalance (QCM). Three distinct thermal treatments, annealed, melted and quenched, were performed and the experimental data obtained was analyzed with the dual mode sorption model. In order to address the effect of crystallinity, 2 different (L:D) contents were used, 80:20 and 98:2.