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Preparation and Characterization of PVA Pure and PVA/MMT Matrix: Effect of Thermal Treatment

Authors : Albana Hasimi, Edlira Tako, Elvin Çomo, Partizan Malkaj, Blerina Papajani, Ledjan Malaj, Mirela Ndrita

Abstract : Many endeavors have been exerted during the last years for developing new artificial polymeric membranes which fulfill the demanded conditions for biomedical uses. One of the most tested polymers is Poly(vinyl alcohol) [PVA]. Ours groups, is based on the possibility of using PVA for personal protective equipment against covid. In them, we explore the possibility of modifying the properties of the polymer by adding Montmorillonite [MMT]. Heat-treatment above the glass transition temperature are used to improve mechanical properties mainly by increasing the crystallinity of the polymer, which acts as a physical network. Temperature-Modulated Differential Scanning Calorimetry (TMDSC) measurements indicated that the presence of 0.5% MMT in PVA causes a higher Tg value and shaped peak of crystallinity. Decomposition is observed at two of the melting points of the crystals during heating 25-240oC and overlap of the recrystallization ridges during cooling 240-25oC. This is indicative of the presence of two types (quality or structure) of polymer crystals. On the other hand, some indication of improvement of the quality of the crystals by heat-treatment is given by the distinct non-reversing contribution to melting. Data on sorption and transport of water in polyvinyl alcohol films: PVA pure and PVA/MMT matrix, modified by thermal treatment, are presented. The thermal treatment has aftereffect the films become more rigid, and because of this, the water uptake is significantly lower in membranes. That is indicates by analysis of the resulting water uptake kinetics. The presence 0.5% w/w of MMT has no significant impact on the properties of PVA membranes. Water uptake kinetics deviates from Fick’s law due to slow relaxation of glassy polymer matrix for all membranes category.

Keywords : crystallinity, montmorillonite, nanocomposite, poly (vinyl alcohol)
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