

Preparation and properties of silica/poly(vinyl alcohol) organic–inorganic hybrid gas barrier films via sol–gel method with microwave irradiation

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ABSTRACT

Silica/poly(vinyl alcohol) (PVA) organic–inorganic hybrid gas barrier films were prepared by sol–gel method with microwave irradiation using tetraethoxysilane (TEOS), methyltriethoxysilane (MeTEOS) and poly(vinyl alcohol) on polypropylene (PP) substrates. Oxygen permeation through the films was measured by a variable-pressure method. Water vapor transmission rate of the films was also evaluated by dish method. Oxygen permeability coefficients of the hybrid layer was small and about one-sixth of those of poly(vinylidene chloride) (PVDC) and water vapor transmission rate of the hybrid layer was the same order of PVDC. Pencil hardnesses (50 g load) of the PP with the hybrid layers were more than HB. These values were considerably higher than that of PP (6B). These properties were thought to be due to well dispersion of inorganic segments (silica) and organic segments (PVA) at molecular level in the hybrid. From the results, it was found that the organic–inorganic hybrids could be applicable to gas barrier films.

Keywords: Organic–inorganic hybrid; Silica; Poly(vinyl alcohol); Gas barrier

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