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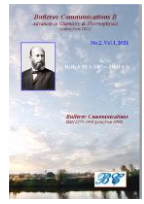

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Water vapor permeable polyurethanes based on branched organophosphorus compounds

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Abstract

Organophosphorus polyurethane ionomers as vapor-permeable membranes were obtained and investigated based on aminoethers of orthophosphoric acid. A feature of the structure of aminoethers of orthophosphoric acid is branching and the presence of terminal hydroxyl groups in their composition. The existence of terminal hydroxyl groups and the presence in the composition of aminoethers of orthophosphoric acid separated in space ion pairs was a prerequisite for the production of vapor-permeable polyurethanes of ionomeric nature based on these compounds and an aromatic polyisocyant. It is shown that the manifestation of vapor permeability is influenced by both the content of phosphate anions in the composition of polyurethanes and the hydrophilic nature of polyoxyethylene glycol (MW = 400) used for the synthesis of aminoethers of orthophosphoric acid. A slight increase in ambient temperature leads to an almost abrupt increase in the vapor permeability coefficient of polyurethanes from 730 g/m^2 to 3400 g/m^2. Water vapor permeability occurs due to the segregation of ionogenic groups with the subsequent formation of clusters. Clusters containing phosphates involve protons associated with them in their internal structure and can form channels through which water molecules move. It was found that the vapor permeability of polyurethanes obtained using polyoxyethylene glycol is practically independent of the ambient humidity. The regularity found in the presented study can be explained by the peculiarity of the formation of the supramolecular structure of polyurethanes, due to the fact that polyoxyethylene glycols are open-chain analogs of crown ethers. This means their high ability to fold and form cavities that capture protons. The results obtained can be associated with the simultaneous presence in the polyurethane matrix of phosphate anions prone to clustering and folding into the conformation of crown ethers of

polyoxyethylene glycols. It has been shown that the ability of polyoxyethylene glycols to form cavities alone cannot be the reason for the manifestation of water vapor permeability in the studied polyurethanes. So, with a decrease in the content of phosphate anions in the composition of polyurethanes, a decrease in their coefficient of water vapor permeability is observed.

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