

SYNTHESIS AND STUDY OF THE PROPERTIES OF POLYVINYL ACETATE DISPERSIONS MODIFIED BY VEGETABLE OILS

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Food packaging plays an important role in solving problems of food preservation, protection from contamination and mechanical damage when contacting with the environment. Polymers play a key role in this process due to their mechanical strength, cost-effectiveness, and ease of processing. However, there are many problems with the use of polymers as packaging materials. While a huge variety of polymers, not all of them can and should be used for food packaging. First of all, it is necessary to carefully select polymers so that contaminants from them do not get into food. Another major issue that has been on the brink of disaster in recent years is environmental pollution by used packaging materials. In this regard, the development and use of recyclable packaging polymers and especially biodegradable packaging materials is relevant.

Polyvinyl acetate (PVAc) is considered a non-toxic and biodegradable synthetic polymers that makes it useful for use as food packaging. One of its disadvantages is rigidity, lack of elasticity; therefore, for application as packaging materials, PVAc should be plasticized. The use of low-molecular weight plasticizers is restricted because they can contaminate food products owing to diffusion. Plasticization of PVAc can be achieved by the use of inner plasticizers – monomers with long alkyl substituents. Those polymerizable plasticizers are copolymerized with vinyl acetate (VA) and as the result are chemically bonded in polymer chain thus lacking ability to diffuse. Dibutyl maleate (DBM) is one of the most widely used polymerizable plasticizer for PVAc. This study is aimed at a search of the natural substituents for DBM to reduce a cost of the final product and diminish a risk of food contamination with residual (unreacted) polymerizable plasticizer. As the natural polymerizable plasticizers have been chosen vegetable oils (VO) namely sunflower, corn, and castor oils, which are produced in Ukraine.

The results of the synthesis and study of the properties of PVAc dispersions modified by VO, compared to similar dispersions of both the plain PVAc and dispersions of VA copolymer with DBM, are discussed in this presentation. Briefly, these results and conclusions are as the follows.

Polyvinyl acetate dispersions modified with VO (sunflower, corn, castor oils) were synthesized according to a typical procedure of polymerization in water dispersion. An addition of OV to VA brings about acceleration of the polymerization process, on the contrary an addition of DBM leads to slowing down the process rate. All the OV studied behave as a quite active comonomers, readily copolymerizing with VA. The final products contain more 65% of OV involved into macromolecules. Among the studied oils, sunflower oil is the most active in copolymerization reactions with VA.

The obtained water dispersions were cast to form polymer films, which were thoroughly investigated for adhesion, opacity, gloss, water absorption, waterproof properties, and water vapour permeability. It has been shown that application of OV-modified PVA films as food packaging reduces the weight loss of food products (e.g. sausages) about twice as compared with the plain PVA films.

Thus, this study confirms the possibility and prospects of using vegetable oils as polymerizable plasticizers capable of copolymerizing with vinyl acetate and providing an effective modification of PVAc film-forming dispersions usable for food packaging.