POLYMERIC MATERIALS FROM HIGH-OLEIC SUNFLOWER OIL-BASED ACRYLIC MONOMER

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Development of renewable polymers is a promising platform to provide new materials with outstanding properties and a positive environmental impact. Due to the large assortment of plant oils, their diversity of fatty acid composition, virtually inexhaustible renewable resources, they are available as raw materials for use in chemical technologies of various industries. Among the variety of plant/vegetable oils high oleic sunflower oil (oleic acid content up to 98%, Fig. 1, A) attracts the attention as the new oil, which has the necessary qualities, but is cheaper, if compared to similar oils, such as olive oil.

In this study, high-oleic sunflower oil was used as an alternative source for new vinyl monomer (Fig.1, B) synthesis. The functional monomer composition determined by FTIR and ^{1}H NMR spectroscopy confirms the presence of an acryloylamide moiety and oleic acid acyl in the monomer molecule. The monomer ability to undergo free radical (co)polymerization was confirmed. The resulted homopolymer with a number-average molecular weight 19,000 has been synthesized in a toluene solution (75^{o}C, initiator - azobisisobutyronitrile). Based on the established polymerizability of the high-oleic sunflower oil-based monomer, it was copolymerized with commercially available counterparts. As a result, stable biobased latexes (Fig. 1, C) with unimodal particle size distribution were obtained in miniemulsion polymerization process (latex copolymer number-average molecular weight of 33,300). The presence of the high oleic sunflower oil-based monomer fragments in the latex polymer macromolecules exhibits the flexibility to the formed copolymers, increases the hydrophobicity and water resistance of the latex films (Fig. 1, D).

Based on the impact of plant oil fragments on the thermomechanical properties of latexes, a range of sustainable polymeric materials with advanced performance capabilities and controlled properties can be obtained.Such polymeric materials can be used to produce paints, adhesives, plasticizers, coatings, etc., as well as reducing the negative impact on the environment.

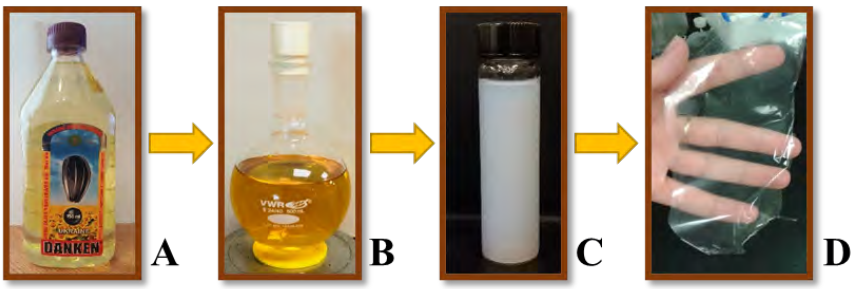

Figure 1. Stages of obtaining polymeric materials from high oleic sunflower oil