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Emulsion polymerization of soybean oil-based acrylic monomers

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Synthesis and free radical polymerization behavior of acrylic monomers from soybean oil triglycerides will be discussed. Conventional radical chain polymerization of new monomers yields linear macromolecules, whereas double bonds of the fatty acid chains remain unaffected and thus capable of post-polymerization oxidative reactions to modify the polymer, if needed.

In radical copolymerization, newly developed monomers with unsaturated long, non-polar fragments can act as a specialty monomers (polymer modifier), even at their low content (2–5 wt%), to provide unique properties and performance (flexibility, toughness, water resistance, adhesion, etc.) of resulting polymeric materials in various industrial applications. Particularly, water resistance of coatings and their mechanical properties can be improved by internal plasticization provided by copolymerizing the soybean oil-based monomers.

Emulsion polymerization is a predominant process widely employed in industry for commercial radical copolymerization and for producing waterborne polymeric materials (latexes in particular). Because of the highly hydrophobic nature of triglyceride molecules, using plant oils in this process has been challenging. Kinetics features and mechanism of latex particles formation in emulsion process with respect to changing soybean oil-based monomer content in co-monomer feed will be another focus of this presentation.