Seminar II

Polymerization Methods for Waterborne Hybrid Polyurethane/Acrylic Particles Preparation

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Abstract

Waterborne polyurethane dispersion have emerged as an important alternative respect to their solventborne counterpart in adhesion and coating applications, because environmental problems are generated due to the release of those solvents to the atmosphere. Therefore, it is mandatory to find alternatives for obtaining waterborne formulations that accomplish the environmental regulations.

In order to improve some polyurethane properties and reduce the production cost, several hybrid systems of polyurethanes/acrylic or vinyl polymers have been proposed, such as the physical blends, interpenetrated networks, hybrids prepared by endcapping [1], grafting or crosslinking [2] of acrylic or vinyl monomers with polyurethane prepolymers leading to diverse macrostructures with differentiated thermal, chemical and mechanical properties. It has been found that hybrid copolymers show better performance and properties than those prepared by simple physical blending [2].

The polymerization methodology for obtaining the hybrid system is fundamental for getting a material with desired mechanical, chemical and adhesive properties. Most of reported methodologies for this propose involve the emulsion [3] and miniemulsion [4] polymerization. However, from the experimental, scaling up and application point of view, these methodologies have some disadvantages, which are associated to the solvent (to decrease viscosity), emulsifiers use (to stabilize dispersions) and environmental hazard.

Recently, it was reported a new methodology, that avoids both solvent and emulsifier use, called solvent/emulsifier free method [5], in which the polyurethane prepolymer is dissolved in vinyl and acrylic fluorinated monomers. The previous methodologies of polymerization use radical polymerization mechanism. However, others studies reported mechanism that include living radical polymerization of copolymers of polyurethane/acrylic; e.g. reversible addition–fragmentation chain-transfer polymerization [6] (RAFT) and atom transfer radical polymerization [7] (ATRP).

This seminar will review and discuss different methodologies and strategies of polymerization to prepare water dispersed hybrid polyurethane/acrylic particles, focusing on systems for coating and adhesive applications.
References


