CONTROLLING POLYMER PARTICLE SIZE USING NANOTRAC FLEX

CONTEXT

Controlling polymer size is essential for optimizing their performance in a wide range of applications. Size directly influences key physical properties such as stability, dispersibility, mechanical strength, and viscosity - factors that significantly affect product quality in manufacturing processes like injection molding and polymer processing. In biomedical applications, particularly in polymeric drug delivery systems, polymer size is critical because it determines how effectively nanoparticles can circulate in the bloodstream and penetrate target cells. Moreover, polymer size, defined by chain length, directly determines molecular weight. Each monomer adds a fixed mass, so longer chains have higher molecular weights, while shorter chains have lower ones. This makes chain length a key factor in a polymer's physical and mechanical properties. Overall, precise control over polymer size enhances functionality, consistency, and reliability across diverse industries.

Challenges in Controlling Particle Size During Polymerization

By adjusting the feeding ratio and modifying reaction conditions like temperature and stirring rate, it is possible to control nanoparticle size in some established reactions. However, identifying the precise reaction conditions to synthesize a polymer of the desired size can be both time-consuming and, at times, impossible.

Fig. 1: Inserting Probe in Polymerization Reaction