66g Generation of Tailored Microparticles by Photopolymerization of Monodisperse Droplets

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We present a technique for generation of tailored microspheres of polymeric materials by in-situ photopolymerization of droplets containing monomers and additives. Highly monodisperse droplets, with size fluctuations of less than 0.01%, were generated by a vibrating orifice aerosol generator (VOAG) and dispersed in air to prevent agglomeration. The droplets were photopolymerized by exposing them to ultra-violet light. The droplet size was controlled by the volumetric flow rate of monomer solution through the orifice, and the vibrating frequency of the orifice.

A number of factors play critical role on the morphology of the final solid polymer particles. These factors include pressure used to generate monodisperse droplets through a vibrating orifice aerosol generator (VOAG), vibration frequency of the orifice, and the surrounding gas temperature, and dispersion air. The results of our experiments show that tailored microspheres (e.g., multicomponent, layered, and with nanoparticle inclusions) of highly reproducible size and physical characteristics can be produced, and the morphology of the final solid polymer particles can controlled by the initial droplet size and composition as well as through the reaction conditions. The results suggest possibility of preparing microparticles of various compounds with reproducible physical properties and functions through adding desired components, such as salt, additives and drugs et al. It is also possible to produce monodisperse multicomponent particles, spherical microcapsules, and micro-resonators.