

Poly lactide Microcapsules and Films: Preparation and Properties

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Abstract

Poly lactide (PLA) is a biodegradable, biocompatible, and nontoxic polyester, which has various applications i.e. in the biomedical, and pharmaceutical field. In the biomedical field, PLA is used to prepare different types of biomaterials e.g. sutures, bone screws, scaffolds, films for tissue engineering, and microcapsules for controlled drug delivery systems. Besides, hollow PLA microcapsules can be used as ultrasound contrast agent (UCA). Imaging of the body with ultrasound can be significantly improved when UCA's are used because these capsules can resonate in the acoustic field which increases the backscatter signal of the ultrasound. Loading the UCA's with drugs gives extra benefits as the drug can be released at the desired location by bursting the capsules with the ultrasound. Successful application of these capsules in the body requires control over their properties. The overall aim of the thesis is to produce hollow microcapsules with controlled properties including size, size distribution, structure, and thermal and mechanical properties.

The microcapsules were prepared with multistage premix membrane emulsification of PLA/dichloromethane/template liquid (i.e. oil) solutions in a nonsolvent solution consists of water or water-alcohol mixtures and proper surfactant (polyvinyl alcohol). After emulsification, the solvent is extracted into the nonsolvent, and consequently the polymer solidifies into polymeric shell around the oil droplet which can be removed later by freeze drying to form hollow microcapsules.

***The research described here was conducted at the laboratory of Food and Bioprocess engineering group, Wageningen University, Wageningen, the Netherlands, under the supervision of Professor Remko Boom and Dr. Karin Schroën.**