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Preparation of laser sintering polymer powders with uniform size and high bulk density by controlling the nucleation in wet process

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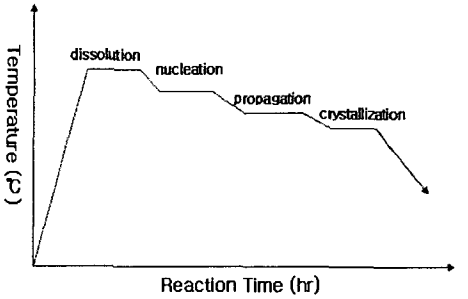

Fig. 1. Manufacturing steps in wet process for the preparation of laser sintering polymer powder

Polyamide 11 and polyamide 12 were studied as the laser sintering materials for the three-dimensional duplicator equipment of SLS (selective laser sintering) process. Though polymer powders had a similar chemical structure, there were some differences in thermal properties, particle size and distribution, and shape. These variations had a close relation with the processibility of laser sintering. As far as the particle shape approached a spherical shape, the processibility was improved. The particle size distribution played an important role in the precision of fabrication.

Polymers for laser sintering were needed in order to fabricate the articles with the three-dimensional duplication equipment of SLS (selective laser sintering) process. The polymer powders were flattened in a powder room by roller inside and then they were sintered by laser. It is very desirable to prepare the polymer powders which have good processibility of laser sintering in order to succeed in three-dimensional duplication. The precise fabrication by laser sintering requires the use of suitable polymeric materials.

In this study, we prepared polymer powders with uniform size and higher bulk density by controlling several finely-controlled steps, such as dissolution, nucleation, propagation and crystallization, in wet process. Several additives were added to improve the thermal, rheological, and flow properties further.

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Preparation of Hydrophilic Semi-Interpenetrating Polymer Network Microcapsules and Drug Release Control

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Introduction

The microcapsule is one of the most useful devices to release active ingredient in more effective, longer, and safer manner. In this study, temperature-sensitive hydrogel microcapsules were synthesized by emulsion-interfacial reaction. Semi-IPN structure of microcapsule kept not only a mechanical strength, but also possibility to show stimuli-response. The swelling behavior of the hydrogel microcapsules was studied of several different temperature. The semi-IPN microcapsules had good temperature-sensitivity.

Experimental

The microencapsulation process and condition used in this study are well described elsewhere and is illustrated in Table 1.

Table 1. Condition of microencapsulelation process

w/o emulsion	Phase	Condition	Amounts
1	Continuou s	Organic solvent Span 80	100ml 3vol%
	Dispersed	Polymer solution Polymer concentration(PVA,PN)	10ml (5wt%,3wt%)
2	Continuou s	Organic solvent Span 80	100ml 3vol%
	Dispersed	GA solution(25%) HCl(35%)	5ml 4drop

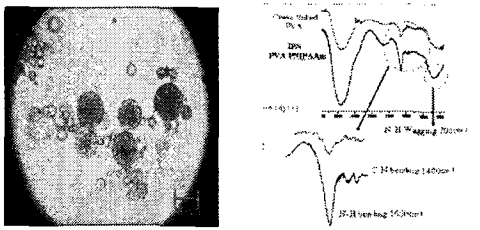

Fig. 1. Morphology of PVA microcapsules and FT-IR spectra.

Results and discussion

PVA microcapsules and IPN microcapsules of PVA and PNIPAAm were synthesized. Microcapsules were visible as transparent particles. Specially, we could see core/shell structure of microcapsules. Core/shell of microcapsules was well described Figure 1. The existence of PNIPAAm in semi-IPN was confirmed by FT-IR peak analysis as appeared N-H wagging from IPN microcapsules in Figure 1.

Figure1.Morphology of PVA microcapsules and FT-IR spectra.

The semi-IPN microcapsules consists of PVA and PNIPAAm. Therefore the increased hydrophilicity caused the increase in the LCST temperature.

Conclusions

We synthesis IPN-structured microcapsule by emulsion interfacial reaction. They have core/ shell structure and they showed temperature-responsive properties and increased hydrophilicity.

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