

Effect of Chemical Composition on Release Behavior and Morphology of Polyurethane Microspheres Prepared By Solvent Evaporation Method

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Abstract

Polyurethane microspheres have been synthesized by solvent evaporation technique with castor oil, Polycaprolacton (PCL), Hexamethylen diisocyanate (HMDI) and Ethyl diamine (ED) as carriers for controlled drug delivery systems. Release behavior of microspheres has been investigated using Bromocresol purple die. Fourier transmission infrared (FTIR), Scanning Electron Microscope (SEM), Optical microscope, dissolution instrument and UV spectrophotometer were used to investigate the polymerization process, surface morphology, particle size, rate of release and calibration curve respectively. Results showed that urethane bonds were formed at $3300\text{-}3400\text{cm}^{-1}$ and $1650\text{-}1700\text{ cm}^{-1}$. SEM micrographs showed surface irregularities as a result of solvent evaporation. Particle sizes were higher for castor oil/HMDI rather than PCL/HMDI microbeads and in both cases, particle size and Bromocresol purple die release increased with rising NCO/OH ratio.

Keywords: Microencapsulation; Microsphere; Polyurethane; Solvent evaporation; Controlled release

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// :

// :

// :

(HMDI)
SEM FTIR
SEM
HMDI /
NCO/OH
UV
cm⁻¹
HMDI /
Dissolution
cm⁻¹

*

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:

Subhaga .[]

TDI MDI

.[]

Kim .

.[]

MDI

Shakla .[]

.[]

.[]

PLMA

.[]

PLNA-co-PEO

Marconi

.[]

.[]

.[]

(HMDI)

PU

.[]

)

PU

nm

(

Shantha .

FTIR

Rao

UV

SEM

²TDI ¹MDI

(BTB)

¹Methylene diphenyl diisocyanate
⁴Cefadroxil

²Toluene diisocyanate
⁵Castor Oil

³Brothymol Blue
⁶Bromocresol Purple

B₄ B₃ B₂ A₄ A₃ A₂

()

rpm

(PCL)

/ /

/

)

g/mol

(Aldrich

/

/ g/mol

(HMDI)

Merck

(Merck)

(Merck)

rpm

) (PVP)

(Aldrich

(°C)

°C

(FTIR)

(SEM)

()

ml PVP

°C

PVP

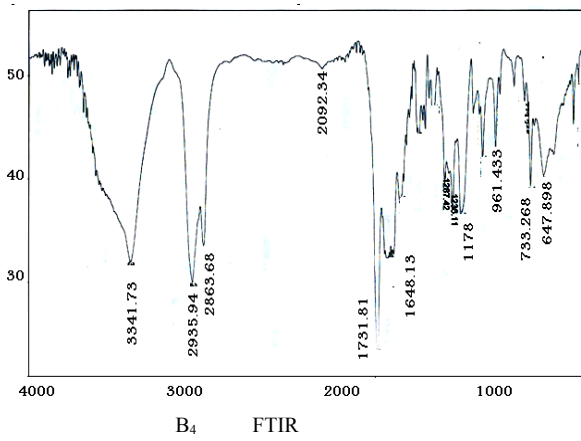
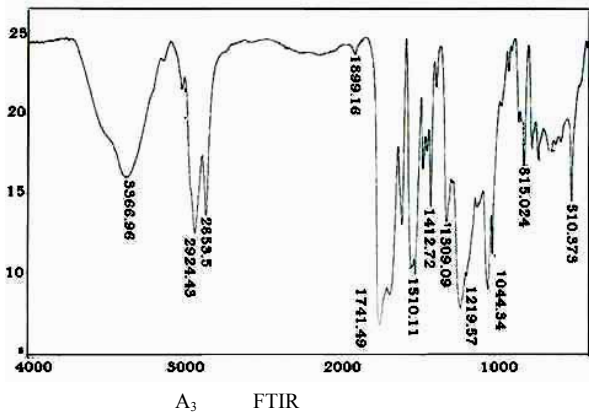
	(g)			
	NCO/OH	HMDI	Castor Oil	PCL
A ₂	:	/		
A ₃	:	/		
A ₄	:	/		
B ₂	:	/		
B ₃	:	/		
B ₄	:	/		

: : : NCO/OH
HMDI (A)

HMDI

(B) PCL

⁷Dispersions



,NCO/OH

	A ₂	A ₃	A ₄	B ₂	B ₃	B ₄
(μm)						

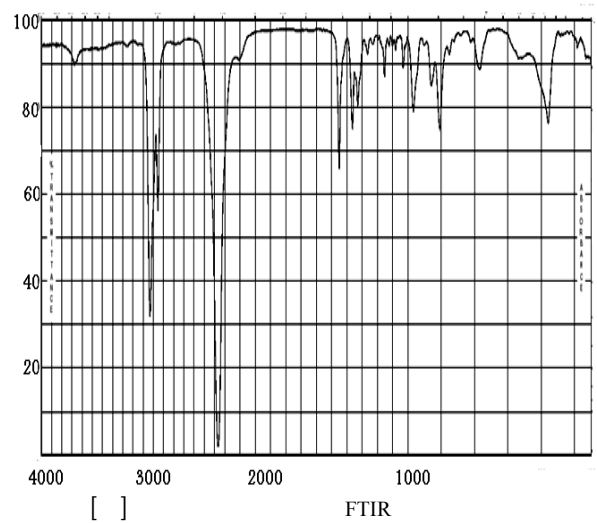
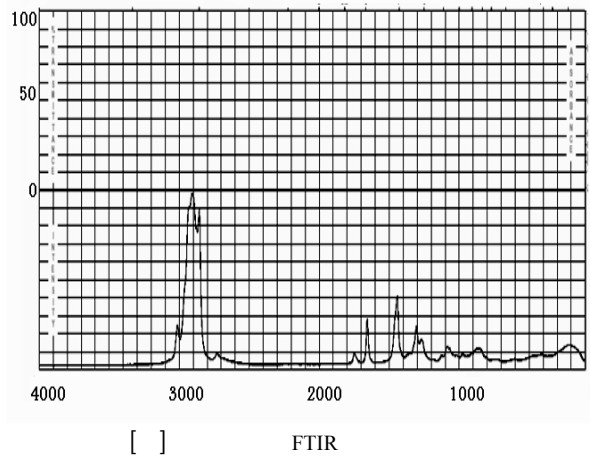
(SEM)

SEM

FTIR

HMDI FTIR
 FTIR []
 (B₄ A₃) : :
 cm⁻¹ HMDI

) cm⁻¹
) cm⁻¹ (NH
 (



Brosse

[]



A₂ SEM



A₃ SEM

Dissolution

UV

(pH=)

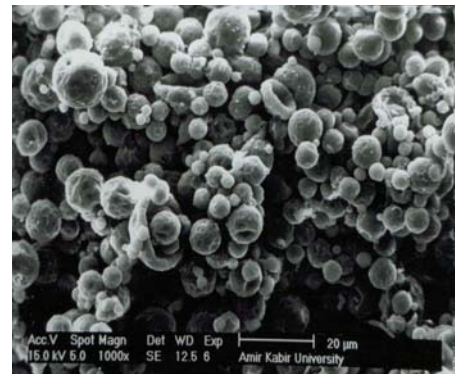
nm

/

ml

ml

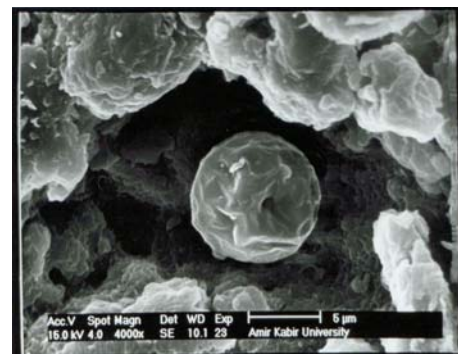
/



B₂ SEM

[]

B₄ B₃ B₂



B₄ SEM

g/mol)
) (/
 (g/mol

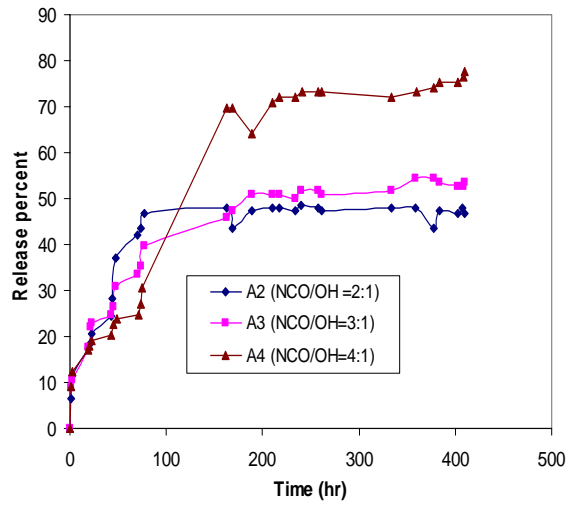
(-OH)
 PCL (-NCO)
 (-OH)

(-NCO)

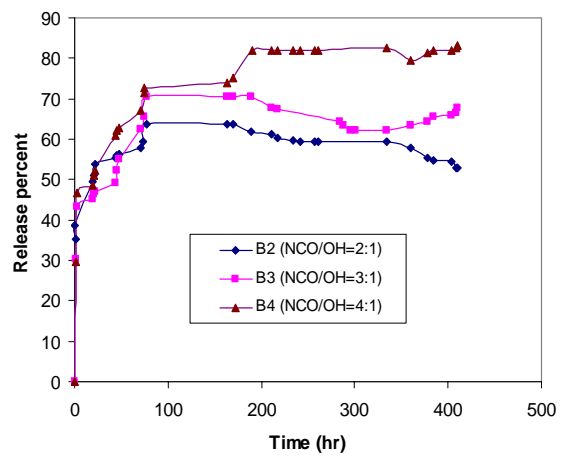
HMDI

,NCO/OH

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HMDI



HMDI

FTIR

SEM

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