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APPENDICES

APPENDIX A

The Determination of Copolymer Density

The stadard method for determination of density of polymer is based on ASTM D 792. Calculation of the density of polymer is as follows :

$$d_p = (a \times d_l)/(a + w - b) \qquad \text{A-1}$$

where:

a = apparent mass of specimen, without wire or sinker, in air (g),

b = apparent mass of specimen (and of sinker, if used) completely immersed and of the wire partially immersed in liquid (g),

w = apparent mass of totally immersed sinker (if used) and of partially immersed wire (g),

d_p = polymer density

d_l = liquid dispersion density

APPENDIX B

The Determination of $\overline{M}_c$ and Crosslinking Density

The crosslinking densities of copolymer were determined using the Flory-Rehner theory (14), for a network as follows:-

$$\overline{M}_c = -V_1 d_p \frac{v_s^{1/3} - v_s/2}{\ln(1-v_s) + v_s + \chi v_s^2} \qquad \text{(B-1)}$$

where,

$\overline{M}_c$ is the number-average molar mass of the chain between crosslinks

V_1 is the molar volume ($cm^3\ mole^{-1}$)

d_p is the polymer density ($g\ cm^{-3}$)

v_s is the volume fraction of the polymer in the swollen gel (cm^3)

χ is the Flory-Huggins interaction parameter between the solvent and the polymer.

The swelling ratio (S) is equal to $1/v_s$. The polymer-solvent interaction parameter was estimated using following formula (14):

$$\chi = 0.431 - 0.311 d_p - 0.036 d_p^2 \qquad \text{(B-2)}$$

Here, the crosslink density, q, is defined as the mole fraction of crosslink units.

$$q = \frac{M_o}{\overline{M}_c} \qquad \text{(B-3)}$$

where M_o is the molecular weight of the polymer repeating unit, can be calculated with the following equation (19):

$$M_o = \frac{(m_{AAm} \times M_{AAm}) + (m_{CA} \times M_{CA}) + (m_{CL} \times M_{CL})}{m_{AAm} + m_{CA} + m_{CL}} \qquad \text{(B-4)}$$

where m_{AAm}, m_{CA} and m_{CL} are the mass in g of acrylamide, crotonic acid and the crosslinker, and M_{AAm}, M_{CA} and M_{CL} are the molar mass in g mol^{-1} of acrylamide, crotonic acid and the crosslinker, respectively.

Table B-1 Data for the determination of $\overline{M_c}$ and crosslinking density

CA (%mol)	N-MBA (%wt)	d_p	v_s	χ	$\overline{M_c}$	M_o	q x10^{-2}
2	0.5	1.35	0.00295	0.43	1158	71.85	6.21
	1	1.66	0.00575	0.43	913	72.26	7.91
	1.5	1.73	0.00745	0.43	800	72.67	9.09
	2	1.85	0.00875	0.43	764	73.06	9.56
10	0.5	1.48	0.00535	0.43	866	74.50	8.60
	1	1.69	0.0065	0.43	851	74.90	8.80
	1.5	1.73	0.0068	0.43	849	75.29	8.87
	2	1.82	0.0076	0.43	827	75.69	9.16

APPENDIX C

The wave number values of functional groups in FT-IR spectra (42).

Wave number (cm^{-1})	Assignment
3300 – 2500	O-H stretching
3330 – 3060	N-H stretching
3000 – 2840	C-H stretching
1720 – 1706	C=O stretching –COOH
1680 – 1630	C=O stretching $-CONH_2$
1650 – 1550	C=O asymmetric stretching for the carboxylate ion
1400	C=O symmetric stretching for the carboxylate ion

VITA

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