

pared using a Carver Hydraulic Laboratory Press (Model C, Carver Laboratory Equipment, Wabash, IN, USA) at 250, 500, 750, and 1000 kg. The compression pressures were 48.74, 97.48, 146.22, and 194.97 MPa, respectively. A rising speed of 0.5 cm/s and a dwell time of 0 were used during compression. Each tablet was prepared at a total weight of 200 mg. The diameter and thickness of tablets were recorded immediately after compression. Apparent particle density was determined in triplicate using a nitrogen-air pycnometer (Automated Gas Pycnometer, Model PYC-G100A-1, Porous Materials, Ithaca, NY, USA). A Heckel plot was then constructed, and the yield pressure was calculated as described previously.⁵

Powder physical properties

An A.B.D. Fine Particle Characteristics Measuring Instrument (Japan) was used for determining the bulk density, tapped density, and repose angle of the powders. Carr index was calculated as the ratio of the difference between tapped density and bulk density to tapped density. The water content of the powder samples was determined using an OHAUS Moisture Determination Balance (Model MB200, USA). After being coated with gold, the powder morphology and the surface and cross section of tablets were examined by scanning electron microscopy (SEM) at a magnifi-

cation of 500x with a Hitachi S-2400 apparatus (Japan) using an accelerating voltage of 15 kV.

Physical properties of tablets

Friability was evaluated by dropping 10 tablets 100 times in a Roche Friabilator (Model AE-20, Aikho Engineering, Taiwan). Disintegration was examined according to the United States Pharmacopoeia (USP XXIII) with 6 tablets for a period of 30 min. Crushing strength was determined using Pharma Test (PTB-311, Germany), and the average for 10 tablets was reported.

RESULTS AND DISCUSSION

Two size fractions (S: 37-61 μ m; L: 61-149 μ m) of codried products of an MCC slurry with various amounts of β -CD (5%, 10%, and 20%) were prepared. These 2 size fractions corresponded to the mean size of the 2 grades of Avicel (PH101 and PH301 = 40 μ m; PH102 and PH302 = 120 μ m) used which had 2 different values of degree of polymerization (DP, PH101 and PH102 = 215-240; PH301 and PH302 = 140-180). The DP value for the MCC slurry used in this study was a little lower than that for Avicel PH101 and 102. The powder characteristics of those MCC products were measured and are listed in Table 1. Ap-

Table 1. Powder characteristics and water content for β -cd and various mcc products

	Angle of repose (°)	Bulk density (g/mL)	Tapped density (g/mL)	Carr's index (%)	True density (g/mL) ^b	Porosity (%) ^c	Porosity (%) ^d	Water content (% w/w)
PH101	48.33 \pm 0.58 ^a	0.299 \pm 0.001	0.399 \pm 0.003	25.04 \pm 0.72	1.456 \pm 0.040	80.66	74.19	3.37 \pm 0.06
PH102	47.17 \pm 1.04	0.327 \pm 0.002	0.421 \pm 0.005	22.34 \pm 0.51	1.561 \pm 0.013	79.05	73.03	3.53 \pm 0.06
PH301	47.67 \pm 0.29	0.442 \pm 0.007	0.575 \pm 0.005	23.25 \pm 1.74	1.539 \pm 0.039	71.28	62.64	3.37 \pm 0.06
PH302	45.50 \pm 0.50	0.444 \pm 0.004	0.553 \pm 0.001	19.65 \pm 0.73	1.500 \pm 0.017	70.40	63.13	3.67 \pm 0.06
1L	40.50 \pm 0.50	0.445 \pm 0.007	0.526 \pm 0.003	15.35 \pm 0.84	1.512 \pm 0.011	70.57	65.21	3.47 \pm 0.06
2L	36.67 \pm 0.58	0.504 \pm 0.004	0.581 \pm 0.004	13.32 \pm 0.21	1.523 \pm 0.020	66.91	61.85	3.43 \pm 0.06
3L	36.33 \pm 1.15	0.510 \pm 0.005	0.583 \pm 0.001	12.60 \pm 0.72	1.521 \pm 0.025	66.47	61.67	3.47 \pm 0.06
4L	35.83 \pm 0.29	0.554 \pm 0.004	0.662 \pm 0.001	16.21 \pm 0.53	1.510 \pm 0.015	63.31	56.16	3.40 \pm 0.00
1S	48.67 \pm 0.58	0.401 \pm 0.002	0.534 \pm 0.004	25.04 \pm 0.41	1.529 \pm 0.008	73.77	65.08	3.53 \pm 0.06
2S	46.17 \pm 0.29	0.421 \pm 0.005	0.556 \pm 0.005	24.42 \pm 0.30	1.507 \pm 0.014	72.06	63.11	3.50 \pm 0.00
3S	44.00 \pm 0.50	0.424 \pm 0.003	0.568 \pm 0.001	25.34 \pm 0.34	1.509 \pm 0.012	71.90	62.36	3.50 \pm 0.00
4S	39.83 \pm 0.76	0.493 \pm 0.001	0.636 \pm 0.002	22.48 \pm 0.39	1.499 \pm 0.007	67.11	57.57	3.53 \pm 0.12
β -CD	43.33 \pm 0.58	0.644 \pm 0.003	0.756 \pm 0.005	14.82 \pm 0.46	1.473 \pm 0.017	56.28	48.68	13.53 \pm 0.06

^aValues are the mean \pm S.D. ($n = 3$); ^bMean \pm S.D. ($n = 6$); ^c(1 - bulk density/true density)*100; ^d(1 - tapped density/true density)*100; L: 61-149 μ m; S: 37-61 μ m.