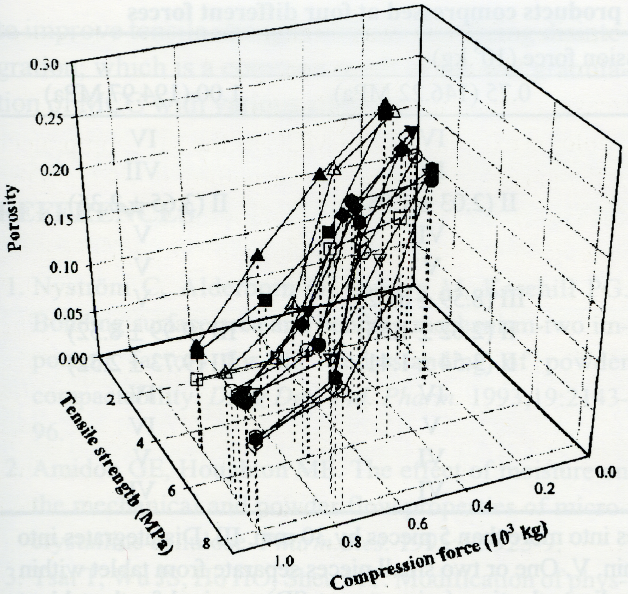

Fig. 3. Relationship between tensile strength and porosity of tablets compressed at 4 different forces for all MCC products.

creased the tensile strength of the resulting tablets compressed at the same level of force. Compression with greater force increased the tensile strength to an extent that increased proportionally with the greater amount of β-CD added. With the same amount of β-CD added, tablets with larger tensile strength were produced with particles of smaller mean size. It can be theoretically considered that the addition of β-CD to MCC products might increase both the bonding area and the bonding force among particles resulting in increased tensile strength of tablets with an increasing amount of β-CD added.

As reported, the tablet strength of MCC prepared with the same DP value is attributed to the bonding area of particles and the interlocking mechanism of MCC fibers.[6,7] The increased bonding area of particles as a result of decreasing particle size would increase the tensile strength of tablets. Similarly, a more fiberlike surface structure on the particles should provide interlocking mechanisms for increasing the tensile strength of tablets. However, results demonstrate that the size effect on tensile strength for the 2 grades of Avicel (PH101 vs PH102 and PH301 vs 302) did not seem to follow this, whereas it was apparent for those MCC products codried with various amounts of β-CD (1L~4L vs. 1S~4S). Possibly, the influence of the interlocking effect of the fiberlike structure on the surface of particles has to be taken into consideration for the former since the fiberlike structure does exist for both grades of Avicel. This further complicates the size effect on the tensile strength of tablets. Nevertheless, the rounded shape of particles of the codried products of MCC with β-CD was evidenced to follow the size effect with a minimal influence of the interlocking effect of the fiberlike structure on the tensile strength of tablets. Therefore, the main mechanism responsible for the improvement in tensile strength with the addition of β-CD could be the increased bonding force from the interaction of β-CD on the surface among codried particles.

Results obviously show the lower DP value of Avicel and the lower tensile strength of the resulting tablets at all 4 compression forces for both size fractions (PH101 vs. PH301 and PH102 vs. PH302). Further, tablets produced with 2 size grades of codried MCC products and 0% β-CD (1L and 1S) had a lower tensile strength than those produced from Avicel PH101 and PH102, but values were comparable to those produced from PH301 and 302. This can be ascribed to a slightly lower DP value of the MCC slurry (DP = 220) used for preparation of the codried products than those of Avicel PH101 and 102 (both with a DP = 215-240). However, the powder characteristics of 1L and 1S might differ from those of Avicel PH101 and 102 as a result of different processing conditions, which have been reported to be an influencing factor partially responsible for variations in powder characteristics of MCC products supplied from different sources.[8,9]

Table 4 illustrates the disintegration characteristics of all MCC products examined in this study compressed at different forces. The deterioration in tablet disintegration for Avicel PH101 and 102 seemed to occur to a greater extent with increasing compression forces than did that for Avicel PH301 and 302. The disintegration of tablets for both grades of Avicel was worse than that for those codried products at the same compression forces. Because of a wicking mechanism, disintegration of MCC tablets should be de-