

RECOMPRESSION OF TABLETS FORMED FROM DIRECT COMPRESSION BASES

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When tablets are formed and recompressed repeatedly before ejection the hysteresis loops obtained by plotting compression force against punch displacement decrease in area with the number of recompressions (White,1977; Travers and Cox,1977). This could be due to further viscoelastic/plastic deformation and should result in demonstrable changes in the physical properties of the tablets.

We prepared tablets (12 mm dia.) and compacts (39 mm dia.) of common direct compression bases by slow compression in a Dartec testing machine. The force vs punch displacement plots on recompression were obtained directly via an XY plotter and both dies gave hysteresis loops which were similar in form. The ejection force vs axial displacement plots were obtained for ejection at constant strain rate. No lubricants were used. Some results for tablets are given below.

| Base | No. of Recompressions to 20 kN | | | | | Max. Ejection Force† (N) |
|----------------|--------------------------------|------|------|------|------|-----------------------------|
| | 1 | 2 | 3 | 4 | 5 | |
| Sta-Rx 1500 | 1.15* | 0.80 | 0.72 | 0.60 | 0.52 | 10 |
| Avicel pH 101 | 0.74 | 0.58 | 0.54 | 0.52 | 0.48 | 157 |
| Paracetamol DC | 0.61 | 0.54 | 0.51 | 0.49 | 0.49 | 800 |
| Emdex | 0.53 | 0.48 | 0.46 | 0.46 | 0.49 | 1200 |
| Encompress | 0.32 | 0.24 | 0.23 | 0.23 | 0.22 | 1400 |

* Area within hysteresis loops (cm²). 1 cm² ≡ 0.1J

† Mean of five results.

The results suggest that the relative ease of ejection is related to the reduction in loop area. Both Sta-Rx and Avicel are good transmitters of radial stress when under axial load (Sixsmith,1975; Travers and Cox,1977), and their ease of ejection probably results from stress relief by elastic or viscoelastic relaxation within the die (cf. Rees and Rue,1977; Hiestand and others,1977). Moreover, although the shape and values for the ejection force vs displacement plots differed for compacts and tablets made from the same base, they were reproducible for all except Sta-Rx and Avicel. This would be expected if these materials exhibit time-dependent stress relief within the die.

Further evidence for this view has been obtained from a study of short-term (thirty minutes) relaxation of the ejected compacts. Force vs displacement plots on diametral compression to fracture indicated that Avicel and Sta-Rx both showed stress relief by time-dependent yielding (cf. Rees and Rue,1977).

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