Conference abstract PMS21

A modification of *Pr* equation for Measurement of Tablet's Compactibility

I. ILIĆ [1], P. KÁSA JR [2], R. DREU [1], K. PINTYE-HÓDI [2], S. SRČIČ [1]

[1] Faculty of Pharmacy, University of Ljubljana, Ljubljana, Slovenia
[2] Faculty of Pharmacy, University of Szeged, Szeged, Hungary

E-mail: ilija.ilic@ffa.uni-lj.si (I. Ilic)

Sci Pharm. 2010; 78: 648 doi:10.3797/scipharm.cespt.8.PMS21

One of several different ways to quantify the compactibility of pharmaceutical powders is the calculation of *Pr* [1], where tensile strength (σ_x) is normalized with the specific work (W_{spec}) of tablet compression (Equation 1):

Eq. 1. $$\mathrm{Pr} = \frac{\sigma_X}{W_{spec}} = \frac{\sigma_X}{E_2 / m}$$

in which W_{spec} is expressed as effective work (E_2) invested in the compression of the unit mass of substance (m). E_2 represents the area of hysteresis between compression and decompression curves in force-displacement measurements during tablet compression cycle.

In our previous experiments [2] we have noticed that the *Pr* is dependent on the maximum compression pressure used to produce the tablet, where *Pr* increases with compression pressure until a plateau is reached. This phenomenon is unwanted from a practical point of view, because it makes the comparison of results very difficult. It has been established, that both tensile strength and specific work yield a linear relationship with compression pressure, so *Pr* can be described as a quotient between two linear functions and is expected to be a constant value. However, the two linear functions do not go through origin of the co-ordinate system. Both functions have a negative y-intercept, which is the mathematical reason for apparent *Pr* dependence on compression pressure.

We propose a modification, indexed as *Pr'* (Equation 2), based on the limit value of *Pr*:

Eq. 2. $$\mathrm{Pr} = \frac{SLOPE(\sigma_x)}{SLOPE(W_{spec})} = \frac{\Delta\sigma_X / \Delta P}{\Delta W_{spec} / \Delta P} = \frac{\Delta\sigma_X}{\Delta W_{spec}} = \frac{\sigma_x(P_2) - \sigma_x(P_1)}{W_{spec}(P_2) - W_{spec}(P_1)}$$

where *SLOPE*s are the slopes of the two linear functions; P_1 and P_2 are two different compression pressures. In the compression pressure range from 68 to 211 MPa the *Pr'* represents asymptotic value of *Pr* in plateau region, validating the equation. This modification enables the comparison of compactibility independently from the compression pressure.

[1] Révész P, Hódi K, Miseta M, Selmeczi B. Production of tablets by direct compressing, Compressibility of active ingredients and auxiliary materials. Gyógyszerészet. 1991; 35: 215–218.

[2] Ilić I, Kása P, Dreu R, Pintye-Hódi K, Srčič S. The compressibiltiy and compactibility of different types of lactose. Drug Dev Ind Pharm. 2009; 35: 1271–1280. doi:10.1080/03639040902932945