

Deformation and Mechanical Characteristics of Compacted Binary Mixtures of Plastic (Microcrystalline Cellulose), Elastic (Sodium Starch Glycolate), and Brittle (Lactose Monohydrate) Pharmaceutical Excipients.

ABSTRACT

This work studies the tensile strength, coherence, elastic, and plastic energy of single and bi-component compacted tablets consisting of (i) microcrystalline cellulose (MCC) PH 102 as a plastic material, (ii) (SSG) as an elastic material, and (iii) alpha lactose monohydrate as a brittle material by direct compression. Compacted tablets were studied with various mass ratios formed at an ultimate compaction stress of 150 MPa. The loading and unloading stages of the compaction process for the single and binary tablets were evaluated based on the energies derived from the force-displacement data obtained. The resulting tablet quality was measured in terms of the tensile strength. Material that exhibit predominantly plastic deformation (MCC) shows a dominant property over elastically deforming sodium starch glycolate (SSG) and brittle (lactose) materials during the loading and unloading stages of the compaction process. In conclusion, the tensile strength of the formed tablets depends directly on the plastic energy and indirectly on the elastic energy and is negatively affected by the presence of a brittle material.

Keyword: Brazilian test, elastic energy (EE), microcrystalline cellulose, plastic energy (PE), sodium starch glycolate, tensile strength