

HOLOGRAPHIC INTERFEROMETRY IN TABLET RELAXATION MEASUREMENT

P. Ridgway Watt, Beecham Pharmaceuticals - Research Division, Brockham Park, Betchworth, Surrey. RH3 7AJ.

The last decade has seen a growth of research interest in the post-compressional phase of powder compaction.

Stress relaxation and creep strain recovery have been investigated through the measurement of variables such as dimensional change, conductance, hardness, acoustic emission, and other factors. Dimensional changes after compression were recorded by Aulton et al, using linear, variable-differential transformers (LVDT) : later, York and Baily devised an optical technique which avoided the possibility of damage to the compact.

The optical technique provides an accurate means of determining tablet diameter and thickness, but is not convenient for studying surface detail, especially on convex tablet forms.

We have used holographic interferometry as an alternative optical method : it provides a complete surface contour map of the strain recovery and can be used with tablets of any shape. The general principles, as applied to the distortion of plastics after injection moulding, have been described by Ennos, but most previous work has involved complex and expensive equipment.

We have used the simplified single-beam holographic method outlined by Phillips in a recent review, with double exposure to provide contour fringes when surface movement has taken place.

A beam of laser light is passed through a lens system and is expanded to a suitable diameter : the expanded beam is directed through a transparent, unbacked, photographic film, at the subject. Scattered light from the surface of the subject is returned by reflexion towards the film, and generates an interference pattern with the original beam. That pattern forms the hologram after subsequent development and bleaching, and the image of the subject can be reconstituted in white light. If two exposures are given, and the subject has moved out-of-plane between the two exposures, then fringes will appear in the image at a half-wavelength spacing of around 300 nm.

In our experiments, Agfa 8E75 film was used, with a 2 mW HeNe laser. Tablets were supported on three points, and viewed from underneath : an initial exposure of three seconds was given. After a delay of five minutes, a second similar exposure was given ; then the film was developed and bleached.

Figures 1, 2 and 3 show respectively the surface movements of flat Avicel tablets with normal, conical, and wedge-shaped packing within the die before compression : wedge-shaped packings have been demonstrated to occur in rotary presses through the combined action of the feed mechanism and centrifugal force.

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Fig. 1



Fig. 2



Fig. 3

