FACULTY OF PHARMACEUTICAL SCIENCES
UNIVERSITY OF COPENHAGEN

FERRING PHARMACEUTICALS

Åbo Akademi

Surface Roughness on Film Coated Extrudates Investigated Using Photometric Imaging

Mette Høg Gaunø, Ph.D. Student
mgj@ferring.com

Niklas Sandler, Crilles Casper Larsen and Jukka Rantanen

Outline

- **Aim of study**
- **Method** –
  - Film coating process parameters
  - Principles of roughness measured by photometric imaging technique
- **Results** – Coating process parameters effect on Ra and Rt surface roughness
- **Conclusion**

Aim of study

The aim of this study:

To investigate the effect of four film coating process parameters on the surface roughness of coated extrudates measured by a photometric imaging technique

Film coating

Film coating process parameters;

- Coating amount (%)
- Concentration of ethyl cellulose in coating solution (w/w %)
- Spray rate of coating solution (g/min)
- Fluidising airflow rate (m^3/h)

2^4 full factorial design → 16 batches

The film coating was performed in a typical lab system coater equipped with a Wurster insert

Principle of photometric imaging technique

- Illumination of the extrudate surface by two light sources
- Extrudates were imaged through a glass window
- Current process imaging system facts:
  - Pixel resolution 10µm
  - Image area 1.2×1.6 cm
  - Optimal size range 50-2000 µm
  - 5-20 images / sec
  - Calculations ~ 50ms

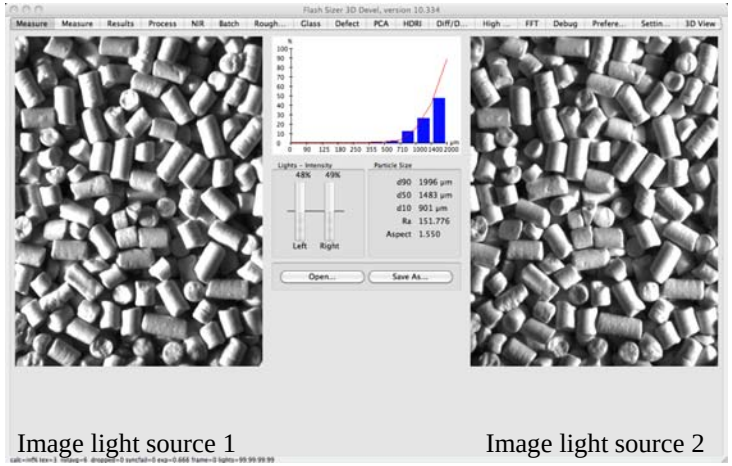
FACULTY OF PHARMACEUTICAL SCIENCES
UNIVERSITY OF COPENHAGEN

FERRING PHARMACEUTICALS

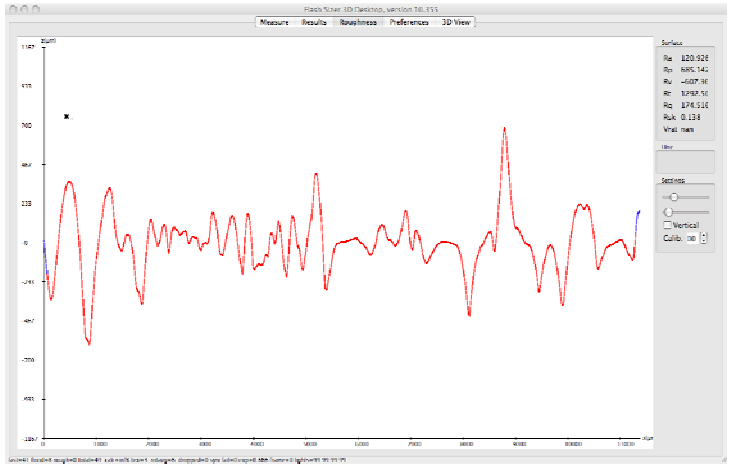
Principle of photometric imaging technique

Åbo Akademi

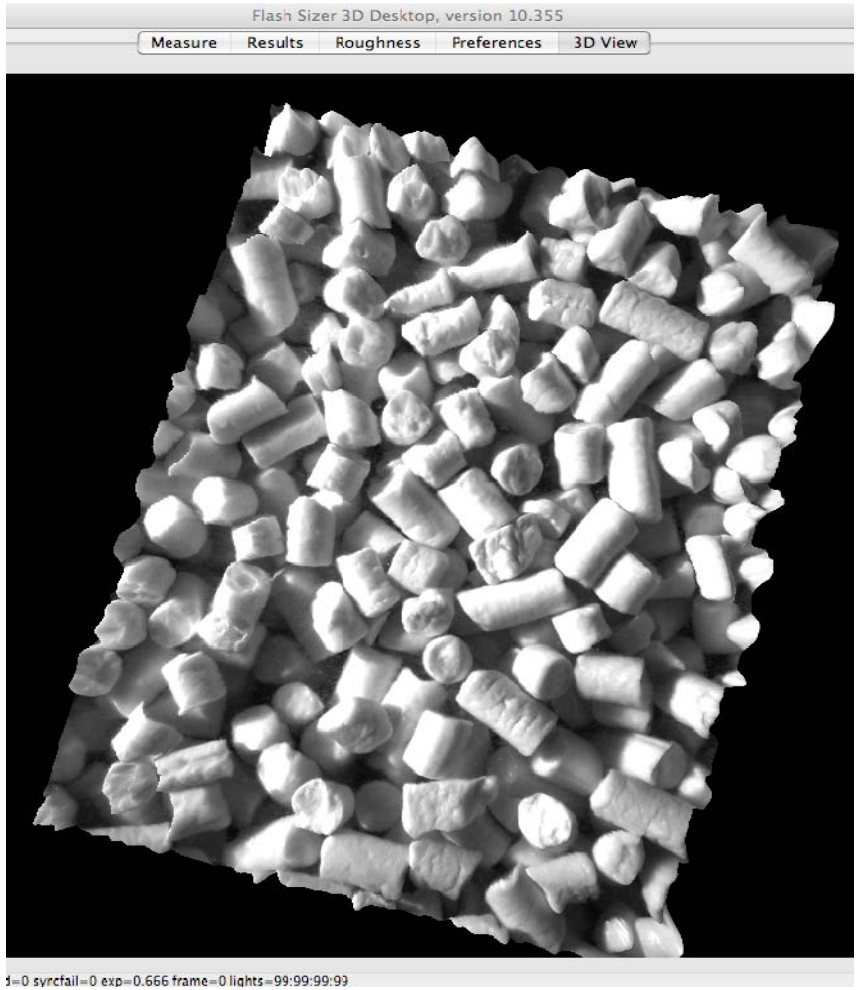
Image capture



Roughness profile line



Reconstruction of 3D image



Ra and Rt roughness

The extrudate surface roughness was calculated based on the digital image information.

In this study the surface roughness was expressed as Ra and Rt

$$Arithmetic\ average\ of\ the\ roughness\ profile,\ R_a = \frac{1}{n}\sum_{i=1}^{n}|yi|$$

$$Maximum\ height\ of\ roughness\ profile,\ Rt = \left(\max_i \times y_i\right) - \left(\min_i \times y_i\right)$$

Results

The calculated average Ra and Rt values was analysed with analysis of variance (ANOVA)

- Increasing coating amount and spray rate → decreasing surface Ra roughness
- Increasing fluidising airflow rate → increasing surface Ra roughness
- Increasing ethyl cellulose concentration → decreasing Rt roughness

Conclusion

- It was possible to see difference in extrudate surface roughness by applying different settings of film coating process parameters

- Photometric imaging tool has proven to be a promising tool for measuring surface roughness of film coated extrudates in a continuous manner