

PRODUCTION AND TESTING OF THE FLAT FACED TABLETS VIA OVERPRINTING OF INJECTION MOULDED TABLET BASES

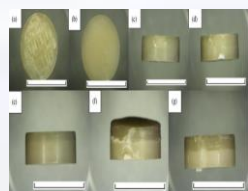
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Abstract

The pharmaceutical industry is exploring the realization of tailored dosage forms for individual patients to provide precision medicine.

My supervisors have previously used a hybrid manufacturing technique that overmoulded (IM) 3D printed (FFF) tablet bases to create tailored dosage forms. They successfully integrated FFF and IM into a multi-step production process, they printed the FFF layer containing the diuretic hydrochlorothiazide, and then overmoulded the other half of the tablet containing lovastatin.

This project will build on this work by focusing on the reverse process, to conduct injection molding part firstly then overprinting on the tablet base to complete the dosage form and control release.



Overmoulded (IM) 3D printed (FFF) tablet bases.



The design of overprinting of injection moulded tablet bases

Objectives

- Design a template plate for consistent overprinting of injection moulded tablet bases.
- Overprinting of tablets containing the drug hydrochlorothiazide using different parameters to obtain control of drug release.
- Extensive testing of overprinted tablets.

Methodology

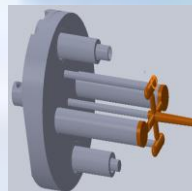
- The previous work was to solve the problem of overprinting on the injection molded samples. The selected materials are ABS, PLA, PETG, etc., to overprint 1.8mm height on its bottom of the 3.6mm height tensile bar molded.
- Afterwards, in the production of single-dose tablets, Hydrochlorothiazide will be used as the raw material drug, PCL and PVPVA as excipients, and the drug release was studied by changing printing parameters, such as printing percentage and raster angle.
- Tablet and extensive testing will involve melt flow indexing, differential scanning calorimetry, scanning electron microscopy, tablet hardness, tablet friability, tablet layer adhesion test, dissolution testing etc.



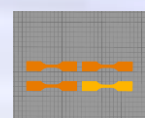
The Micro-injection molding machine is Babyplast 6/12 (Rambaldi, Italy).



MakerGear M2 Rev. E.(M2e).



The profile of half thickness (10 mm x1.8 mm) tablet mold.



Lay the molds on the software plane.



Clamp the template on the 3D printer platform.



Print the first layer of half thickness tensile bar.



Adjust the printing height and save the printing file.



Make the tensile bar template.



Maker the outline of the shape of the tensile bar.

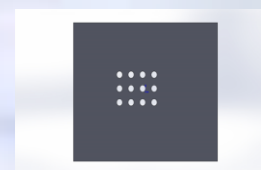


Print and get the sample.

- Continuous operation and simplified steps.
- The printing effect is suitable, the interlayer has good adherence.
- Need to solve the problem of batch fast printing.

Future work

- Polymer screening: The drug will be selected to compound with a suitable polymer for hot-melt extrusion. The chosen polymers can be modified for printing via melt-blending with suitable polymers.
- Filament and pellets production: After the polymer formulation is determined, the production is pelletized into granule for injection moulding, and drug loaded filament are used for 3D printing. The drug loading will be determined based on the single-dose required.
- Injection moulded tablets production: The pellets should be put into the mould to produce the first insert part.
- Bilayer tablet moulding: Once the insert has been produced the printing of single dose tablet can begin. The insert is placed into the template and second layer is printed onto the first.
- Tablet extensive testing: Tablet and extensive testing will involve melt flow indexing, differential scanning calorimetry, scanning electron microscopy, tablet hardness, tablet friability, tablet layer adhesion test, dissolution testing etc.



The template plate of overprinting based on injection moulded tablet.

Reference

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