

3D PRINTING PHARMACEUTICAL HPMC-BASED FILAMENTS LOADED WITH SODIUM ALGINATE, PECTIN AND CHITOSAN PREPARED VIA HOT-MELT EXTRUSION

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Fused Deposition Modeling (FDM) has become one of the most widespread 3D printing technologies in many industries, especially for the creation of prototypes and unique objects. Although the principle of modeling is always the same, the requirements that come to developers from different areas are various.

Most commercially available printers use thermoplastic filaments for FDM process. For applying FDM in 3D printing of orally administrated personalized or model dosage forms, it is essential to operate with safe ingredients. For this reason, there is a growing interest in filaments made from biocompatible polymers already well established in pharmaceutical manufacturing. For the preparation of filaments, input raw materials having the preconditions for processing in hot-melt extrusion (HME) are selected. This process involves melting the feed mixture in a heated cylindrical barrel with a rotating screw inside. The screw transfers the melt through the hole die. The material is cooled at the outlet and solidifies to form a filament of defined diameter.

Many publications focus on drug-loaded filaments. However, filaments with the absence of active ingredient (API) also offer new possibilities in the optimization of dosage forms. It can be used to print tablet coatings or capsules. By modifying the geometry and material composition, different release kinetics of the API in the digestive tract can be achieved. This can be used to optimize therapy according to the needs of the individual in accordance with the trend of personalized medicine.

We deal with the possibility of processing biopolymers in HME for the preparation of 3D printable drug-free filaments. They are based on HME-tested hydroxypropyl methylcellulose type processed in admixture with selected biopolymers used in the formulation of controlled release dosage forms. Sodium alginate, citrus pectin and chitosan were selected for the preparation of filaments suitable for printing tablet coatings and capsules.