Claims

[Claim 1] A pharmaceutical dosage form, comprising:
a bottom formed by a first material;
a peripheral wall formed by a second material,
wherein the bottom and the peripheral wall together form a shell forming a compartment comprising an opening;
an interior cover formed by a third material,
wherein the interior cover is attached to the shell,
wherein the interior cover at least partially covers the opening of the compartment, and
wherein the interior cover comprises one or more openings in communication with the compartment formed by the shell;
a fourth material in the compartment, wherein the fourth material comprises a pharmaceutically acceptable material; and
an exterior cover formed by a fifth material,
wherein the exterior cover is attached to the interior cover and/ or the shell, and
wherein the exterior cover is configured to cover, at least partially, the interior cover.

[Claim 2] The pharmaceutical dosage form of claim 1, wherein the shell forms one or more additional compartments.

[Claim 3] The pharmaceutical dosage form of any one of claims 1-2, wherein the fourth material is a liquid, semi-solid or solid material.

[Claim 4] The pharmaceutical dosage form of any one of claims 1-3, wherein the pharmaceutically acceptable material is heat labile.

[Claim 5] The pharmaceutical dosage form of any one of claims 1-4, wherein the first material of the bottom and the second material of the peripheral wall are monolithic.

[Claim 6] The pharmaceutical dosage form of any one of claims 1-5, wherein the exterior cover is configured to fully cover all of the one or more openings of the interior cover.

[Claim 7] The pharmaceutical dosage form of any one of claims 1-6, wherein the first material and the second material are the same; or optionally the second material and the third material are the same; or
optionally wherein dissolution rate of the third material is different from that of the fifth material or
optionally the third material and the fifth material have the same dissolution rate.

[Claim 8] A pharmaceutical dosage form, comprising:
a bottom formed by a first material;
a peripheral wall formed by a second material,
wherein the bottom and the peripheral wall together form a shell forming a compartment comprising an opening;
an interior cover formed by a third material,
wherein the interior cover is attached to the shell, and
wherein the interior cover covers the opening of the compartment;
a fourth material in the compartment, wherein the fourth material comprises a pharmaceutically acceptable material; and
an exterior cover formed by a fifth material; or
optionally the fifth material comprises a component that is incompatible with a component of the fourth material;
wherein the exterior cover is attached to the interior cover and/ or the shell, and
wherein the exterior cover is configured to cover, at least partially, the interior cover.

[Claim 9] The pharmaceutical dosage form of claim 8, wherein the pharmaceutically acceptable material comprises a heat labile component; or
optionally wherein the third material of the interior cover is an erodible material.

[Claim 10] The pharmaceutical dosage form of any one of claims 8-9, wherein the interior cover comprises a mesh.

[Claim 11] A method for preparing a pharmaceutical dosage form by three-dimensional printing, wherein the method comprises:
printing a bottom of the pharmaceutical dosage form using a first material;

printing a peripheral wall of the pharmaceutical dosage form using a second material,
wherein the bottom and the peripheral wall together form a shell forming a compartment comprising an opening;
printing an interior cover attached to the shell using a third material,
wherein the interior cover at least partially covers the opening of the compartment, and
wherein the interior cover comprises one or more openings in communication with the compartment formed by the shell;
delivering, after the printing of the interior cover, a fourth material to the compartment through the opening of the compartment; and
printing an exterior cover attached to the interior cover and/ or shell using a fifth material, such that the exterior cover is configured to cover, at least partially, the interior cover.

[Claim 12] The method of claim 11, wherein the printing the interior cover comprises flowing the third material out through a nozzle and depositing the third material to form the interior cover, and wherein the movement of the nozzle during the printing the interior cover is set to first print a portion that is relatively far away from each opening of the one or more openings of the interior cover; or
optionally each opening of the one or more openings of the interior cover is an elongated opening extending roughly along a second axis, and
wherein when printing the interior cover, the angle between the nozzle's moving direction and the second axis is less than 50°.

[Claim 13] The method of claims 11-12, wherein the printing the interior cover comprises depositing the third material to a portion of the shell and extending over the compartment formed by the shell such that at least a portion of the interior cover is suspended over the compartment formed by the shell; or
optionally the printing the interior cover comprises depositing the third material to a portion of previously printed interior cover and extending over the compartment formed by the shell such that at least a portion of the interior cover is suspended over the compartment formed by the shell.

[Claim 14] The method of any one of claims 11-13, wherein the fourth material is a liquid or semi-solid.

[Claim 15] The method of any one of claims 11-14, wherein the three-dimensional printing is a melt extrusion deposition (MED) technique; or optionally a semi-solid extrusion technique.