

CLAIMS

WHAT IS CLAIMED IS:

1. A method for storing and preserving moisture sensitive products, the products optionally being diagnostic test strips, the method comprising:

(a) providing a moisture tight container formed of a polymeric material, the container having an internal volume in a range of 12mL to 30mL, the container comprising:

(i) a container body having a base and a sidewall extending therefrom, the container body defining an interior, the container body further having an opening leading to the interior;

(ii) a lid connected to the container body by a hinge, the lid being pivotable about the hinge with respect to the container body to move the container between a closed position in which the lid covers the opening so as to create a moisture tight seal with the container body and an open position in which the opening is exposed; and

(iii) an insert secured within the interior of the container body, the insert comprising a base material and a desiccant, wherein the base material provides structure to the insert and is optionally a polymer, the insert having an insert opening leading to an interior compartment configured for housing moisture sensitive products;

(b) disposing a plurality of moisture sensitive products, optionally diagnostic test strips, into the interior compartment when the container is in the open position; and

(c) moving the container into the closed position, thereby creating the moisture tight seal between the lid and the container body;

wherein:

(aa) the container provides a shelf life to the moisture sensitive products of at least 12 months, optionally at least 18 months, optionally at least 24 months, optionally 18 months to 36 months;

(bb) the container, when in the closed position, has a moisture vapor transmission rate, at ambient conditions of 30°C and 75% relative humidity (RH), of less than 500 µg/day, optionally less than 400 µg/day, optionally less than 350 µg/day, optionally less than 325 µg/day, optionally less than 300 µg/day, optionally from 150 µg/day to 300 µg/day, optionally 175 µg/day to 285 µg/day; and

(cc) the insert is less than 3.25g in mass, optionally 1.5g to 3g, optionally 1.5g to 2.75g, optionally 1.75g to 2.75g, optionally 2g to 2.75g, optionally about 2.5g.

2. The method of claim 1, wherein the moisture tight seal comprises a plurality of engaged mating seals in series between the container body and the lid when the container is in the closed position, the plurality of engaged mating seals including at least a first seal and a second seal;

wherein the first seal is formed by mating a thermoplastic sealing surface of the container body to a thermoplastic sealing surface of the lid, the second seal being formed by mating a thermoplastic sealing surface of the container body with an elastomeric sealing surface of the lid, the elastomeric sealing surface comprising an elastomeric ring, optionally comprising a thermoplastic elastomer (TPE), that is configured to be compressed by an upper surface of a rim surrounding the opening when the container is in the closed position, wherein vertical compression of the elastomeric ring causes a portion of the ring to elastically expand radially into a void provided between the container body and the lid, the elastomeric sealing ring optionally having a Shore A hardness of from 20 to 50, optionally from 20 to 40, optionally from 20 to 35.

3. The method of claim 1, wherein the moisture tight seal comprises at least a first seal and a second seal, the first seal being formed by mating thermoplastic-to-thermoplastic sealing surfaces of the lid and the container body respectively, the first seal optionally including an undercut of the container body relative to a central axis of the container body or a lip seal member extending downward from the lid, the second seal being formed by mating elastomer-to-thermoplastic sealing surfaces, wherein the elastomer-to-thermoplastic sealing surfaces includes an elastomer, optionally a thermoplastic elastomer (TPE), formed in the lid or on the container body, optionally with multi-shot injection molding, wherein the thermoplastic is incompressible and the elastomer is compressible and optionally resilient, the elastomer optionally having a Shore A hardness of from 20 to 50, optionally from 20 to 40, optionally from 20 to 35.

4. The method of claim 2 or 3, wherein the first seal requires an opening force to transition the container from the closed position to the opened position and the second seal in

combination with the first seal does not require a force greater than the opening force to transition the container from the closed position to the opened position.

5. The method of any previous claim, wherein the container requires an opening force to transition the container from the closed position to the opened position and wherein the opening force is from 3 to 7 lbf (pound-force), optionally from 4 to 6 lbf.

6. The method of any of claims 2-5, wherein the first seal includes an undercut of the container body relative to a central axis of the container body, wherein the undercut is provided in a lip extending upwards from the sidewall and surrounding the opening, the lid including a depending skirt, the undercut having a surface that mates with a corresponding surface of the skirt, forming the first seal.

7. The method of any previous claim, optionally of claim 1, wherein an undercut surface of the container body engages an undercut surface of the lid in a snap-fit closing relationship.

8. The method of any previous claim, optionally of claim 7, wherein the undercut surface of the container body and/or the undercut surface of the lid do not extend completely around a respective perimeter thereof.

9. The method of any previous claim, optionally of claim 7, wherein the undercut surface of the container body and the undercut surface of the lid form the moisture tight seal therebetween.

10. The method of any previous claim, optionally of any of claims 2-6, wherein the first seal and the second seal combined provide the container when the lid is in the closed position a lower moisture vapor transmission rate (MVTR) than the first seal would provide without the second seal.

11. The method of any previous claim, optionally of any of claims 2-6 and 10, wherein the elastomer or elastomeric ring is from 0.25 mm to 1.25 mm thick.

12. The method of any preceding claim, wherein a void is provided between an exposed portion of an outer surface of the insert and a portion of an inner surface of the container body, and wherein at least one fluid pathway is provided between the void and the interior compartment of the insert.

13. The method of any previous claim, optionally of claim 12, wherein the insert has a total exposed surface area that is at least 1.75 times, optionally at least 2.0 times an exposed surface area of the interior compartment.

14. A moisture tight container, the container having an internal volume in a range of 12mL to 30mL, the container comprising:

(a) a container body having a base and a sidewall extending therefrom, the container body defining an interior, the container body further having an opening leading to the interior and a lip surrounding the opening;

(b) a lid being movable with respect to the container between a closed position in which the lid covers the opening so as to create a moisture tight seal with the container body and an open position in which the opening is exposed;

(c) at least a first seal and a second seal, the first seal being formed by mating thermoplastic-to-thermoplastic sealing surfaces of the lid and the container body respectively, the first seal optionally including an undercut of the container body relative to a central axis of the container body or a lip seal member extending downward from the lid, the second seal being formed by mating elastomer-to-thermoplastic sealing surfaces, wherein the elastomer-to-thermoplastic sealing surfaces includes an elastomer formed in the lid or on the container body, optionally with multi-shot injection molding, wherein the thermoplastic is incompressible and the elastomer is compressible and optionally resilient; and

(d) an insert secured within the interior of the container body, the insert comprising a base material and a desiccant, wherein the base material provides structure to the insert and is optionally

a polymer, the insert having an insert opening leading to an interior compartment configured for housing products;

wherein:

- (i) the container, when in the closed position, has a moisture vapor transmission rate, at ambient conditions of 30°C and 75% relative humidity (RH), of less than 500 $\mu\text{g/day}$, optionally less than 400 $\mu\text{g/day}$, optionally less than 350 $\mu\text{g/day}$, optionally less than 325 $\mu\text{g/day}$, optionally less than 300 $\mu\text{g/day}$, optionally from 150 $\mu\text{g/day}$ to 300 $\mu\text{g/day}$, optionally 175 $\mu\text{g/day}$ to 285 $\mu\text{g/day}$;
- (ii) the insert is less than 3.25g in mass, optionally 1.5g to 3g, optionally 1.5g to 2.75g, optionally 1.75g to 2.75g, optionally 2g to 2.75g, optionally about 2.5g; and
- (iii) the container comprises a polymeric material.

15. The container of claim 14, wherein the lid is connected to the container body by a hinge, the lid being pivotable about the hinge with respect to the container body to move the container between the closed position and the open position.

16. The container of claim 14 or 15, wherein the second seal is formed by mating a thermoplastic sealing surface of the container body with an elastomeric sealing surface of the lid, the elastomeric sealing surface comprising an elastomeric ring, optionally comprising a thermoplastic elastomer (TPE), that is configured to be compressed by an upper surface of a rim surrounding the opening when the container is in the closed position, wherein vertical compression of the elastomeric ring causes a portion of the ring to elastically expand radially into a void provided between the container body and the lid, the elastomeric sealing ring optionally having a Shore A hardness of from 20 to 50, optionally from 20 to 40, optionally from 20 to 35.

17. The container of any of claim 14-16, wherein the first seal requires an opening force to transition the container from the closed position to the opened position and the second seal in combination with the first seal does not require a force greater than the opening force to transition the container from the closed position to the opened position.

18. The container of any of claims 14-17, wherein the container requires an opening force to transition the container from the closed position to the opened position and wherein the opening force is from 3 to 7 lbf (pound-force), optionally from 4 to 6 lbf.

19. The container of any of claims 14-18, wherein the first seal and the second seal combined provide the container when the lid is in the closed position a lower moisture vapor transmission rate (MVTR) than the first seal would provide without the second seal.

20. The container of any of claims 14-19, wherein the elastomer is at least 0.25 mm thick, optionally from 0.25 mm to 1.25 mm thick.

21. The container of any of claims 14-20, wherein a void is provided between an exposed portion of an outer surface of the insert and a portion of an inner surface of the container body, and wherein at least one fluid pathway is provided between the void and the interior compartment of the insert.

22. The container of claim 21, wherein the insert further has a bottom end portion and a top-edge portion disposed opposite the bottom end portion; wherein the top-edge portion defines the opening leading to the interior compartment; and wherein the at least one fluid pathway is provided through: a) at least one thru hole in the insert, and/or b) at least one gap between the top-edge portion and the inner surface of the container body.

23. The container of claim 22, wherein the at least one fluid pathway is provided through a plurality of thru holes in the insert.

24. The container of any of claims 21-23, wherein a plurality of protrusions are provided on: a) the outer surface of the insert, and/or b) the inner surface of the container body; wherein the plurality of protrusions engage the inner surface of the container body.

25. The container according to claim 24, wherein the plurality of protrusions comprises ridges provided on the outer surface of the insert; and wherein the ridges extend longitudinally from proximate the top-edge portion to proximate the bottom edge portion.

26. The container according to any of claims 14-25, wherein the insert is an entrained polymer further comprising a channeling agent.

27. The container according to any of claims 14-26, wherein the insert has a total exposed surface area that is at least 1.75 times, optionally at least 2.0 times an exposed surface area of the interior compartment.

28. Use of the container of any of claims 14-27 for storage of diagnostic test strips.

29. A process for manufacturing a group of at least forty (40) moisture tight flip-top vials, wherein each group consists of 17 mL vials or 24 mL vials, the method comprising, for each vial:

(a) providing a container body having a base and a sidewall extending therefrom, the container body defining an interior, the container body further having an opening leading to the interior and a lip surrounding the opening;

(b) providing a lid connected to the container body by a hinge, the lid being pivotable about the hinge with respect to the container body to move the vial between a closed position in which the lid covers the opening so as to create a moisture tight seal with the container body and an open position in which the opening is exposed; and

(c) providing at least a first seal and a second seal, the first seal being formed by mating thermoplastic-to-thermoplastic sealing surfaces of the lid and the container body respectively, the first seal optionally including an undercut of the container body relative to a central axis of the container body or a lip seal member extending downward from the lid, the second seal being formed by mating elastomer-to-thermoplastic sealing surfaces, wherein the elastomer-to-thermoplastic sealing surfaces includes an elastomer formed in the lid or on the container body, optionally with multi-shot injection molding, wherein the thermoplastic is incompressible and the elastomer is compressible and optionally resilient;

wherein:

(i) the group of at least 40 17mL vials, when in the closed position, has a mean moisture vapor transmission rate, at ambient conditions of 30°C and 80% relative humidity (RH), of from 275 µg/day to 325 µg/day, optionally about 300 µg/day, with a standard deviation of less than 30, optionally less than 25; optionally from 15 to 30; or

(ii) the group of at least 40 24mL vials, when in the closed position, has a mean moisture vapor transmission rate, at ambient conditions of 30°C and 80% relative humidity (RH), of from 375 µg/day to 425 µg/day, optionally about 400 µg/day, with a standard deviation of less than 40, optionally less than 35, optionally from 20 to 40.

30. The process of claim 29, wherein the second seal is formed by mating a thermoplastic sealing surface of the container body with an elastomeric sealing surface of the lid, the elastomeric sealing surface comprising an elastomeric ring, optionally comprising a thermoplastic elastomer (TPE), that is configured to be compressed by an upper surface of a rim surrounding the opening when the vial is in the closed position, wherein vertical compression of the elastomeric ring causes a portion of the ring to elastically expand radially into a void provided between the container body and the lid, the elastomeric sealing ring optionally having a Shore A hardness of from 20 to 50, optionally from 20 to 40, optionally from 20 to 35.

31. The process of claim 29 or 30, wherein the first seal requires an opening force to transition the vial from the closed position to the opened position and the second seal in combination with the first seal does not require a force greater than the opening force to transition the vial from the closed position to the opened position.

32. The process of any of claims 29-31, wherein the vial requires an opening force to transition the vial from the closed position to the opened position and wherein the opening force is from 3 to 7 lbf (pound-force), optionally from 4 to 6 lbf.

33. The process of any of claims 29-32, wherein the first seal and the second seal combined provide the vial when the lid is in the closed position a lower moisture vapor transmission rate (MVTR) than the first seal would provide without the second seal.

34. The process of any of claims 29-33, wherein the elastomer is from 0.25 mm to 1.25 mm thick.