HEAT GENERATING PACKAGING MATERIAL

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ABSTRACT
A heat generating packaging material is disclosed for packaging of temperature sensitive materials, the heat generating packaging material mitigating against damage to the heat sensitive material by maintaining a temperature in the packaging within a predetermined range.
FIG - 1
HEAT GENERATING PACKAGING MATERIAL

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of provisional patent application No. 60/697,697, filed Jul. 8, 2005.

FIELD OF THE INVENTION

[0002] The invention relates to a heat generating material, and more particularly to a heat generating packaging material for packaging of temperature sensitive materials to mitigate against damage thereto by maintaining a temperature within a predetermined range.

BACKGROUND OF THE INVENTION

[0003] U.S. Pat. No. 5,046,479 is incorporated herein by reference in its entirety to provide background for the invention.

[0004] Storage of temperature sensitive materials, such as pharmaceuticals, for example, require that a specific temperature range be maintained which will prevent the material from being damaged or otherwise rendered ineffective. In typical storage areas, this is accomplished simply by maintaining a temperature in the storage area within the specific temperature range.

[0005] During shipping of materials however, it is difficult to predict the environment through which the materials will travel. Thus, it is difficult to know whether the materials will be maintained within the specific temperature range.

[0006] It would be desirable to produce a heat generating packaging material for maintaining contents of a package being shipped within a predetermined temperature range to mitigate against temperature related damage thereto.

SUMMARY OF THE INVENTION

[0007] Harmonious with the present invention, a heat generating packaging material for maintaining contents of a package being shipped within a predetermined temperature range to mitigate against temperature related damage thereto, has surprisingly been discovered.

[0008] In one embodiment, a heat generating packaging material comprises a heating agent; and an air-permeable covering enclosing the heating agent, the covering having an air permeability per unit time of between 10000 and 25000 sec/100 cc resulting in a reaction of the heating agent lasting up to 48 hours.

[0009] In another embodiment, a heat generating packaging material comprises a heating agent consisting essentially of metal powder, water, water-retaining agent, activated carbon, and salt; and an air-permeable covering enclosing the heating agent, the covering having an air permeability per unit time of between 10000 and 25000 sec/100 cc resulting in a reaction of the heating agent lasting up to 48 hours.

[0010] The invention also provides methods of maintaining a desired temperature in a shipping package.

[0011] In one embodiment, a method of maintaining a desired temperature in a shipping package comprises the steps of providing a heat generating packaging material having a heating agent disposed in an air-permeable covering, the covering having an air permeability per unit time of between 10000 and 25000 sec/100 cc resulting in a reaction of the heating agent lasting up to 48 hours; and disposing the heat generating packaging material in the shipping package to maintain the package within the desired temperature range.

DESCRIPTION OF THE DRAWINGS

[0012] FIG. 1 is a perspective view of a heat generating packaging material in accordance with an embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] The following detailed description describes an embodiment of the invention. The description and incorporated patent document serve to enable one skilled in the art to make and use the invention, and are not intended to limit the scope of the invention in any manner. In respect of the methods disclosed and illustrated, the steps presented are exemplary in nature, and thus, the order of the steps is not necessary or critical.

[0014] FIG. 1 shows a disposable heat generating packaging material 10 for shipping of temperature sensitive materials having a length L and a width W. The heat generating packaging material 10 has been found to be particularly useful in the shipping of pharmaceutical products. Favorable results have been found wherein the heat generating packaging material 10 has an approximate length L of 17 centimeters and an approximate width W of 11 centimeters. These dimensions allow for the heat generating packaging material 10 to fit on the bottom and top of containers holding vials of pharmaceutical liquids, for example. However, packets having alternate dimensions can be formed without departing from the scope or spirit of the invention. For background in respect of materials used in the production of the heat generating packaging material 10 and the like, U.S. Pat. No. 5,046,479 is incorporated herein by reference.

[0015] The heat generating packaging material 10 includes an air-permeable covering 12 having a first portion 14 and a second portion 16. The air-permeable covering 12 has an air permeability per unit time limited to between 10000 to 25000 sec/100 cc to maintain a pressure within the air-permeable covering 12 below a predetermined limit to avoid inflation thereof. The air-permeable covering 12 is sealed around an outer edge 17 thereof by any conventional means. The air-permeable covering 12 houses a heating agent 18. The heating agent 18 typically includes a mixture of metal powder, such as iron powder, with assistants such as water, activated carbon, water-retaining agent such as wood flour or vermiculite, and salt. An exothermic reaction is caused by supplying oxygen (air) to the contents within. In the illustrated embodiment, a typical heating agent composition includes about 55 to 65% by weight of iron powder, 18 to 22% by weight of water, 9 to 11% by weight of water-retaining agent, 3.5 to 4.5% by weight of activated carbon, and about 4.5 to 6% by weight of salt, although other heating agent compositions can be used as desired. Optionally, a coating (not shown) may be applied to the air-permeable covering 12 to mitigate against damage thereto,
such as from undesirable condensation. Prior to usage, the heat generating packaging material 10 is disposed in a sealed container (not shown) to mitigate against oxygen or air being supplied to the heat generating packaging material 10.

[0016] In use, the heat generating packaging material 10 is activated by opening the sealed container, thus exposing the air-permeable covering 12 and heating agent 18 to oxygen (air). Typically, the heat generating packaging material 10 is disposed within a shipping package (not shown), which reduces exposure to air thereby limiting the amount of oxygen entering the air-permeable covering 12 and slowing the reaction. The result will be a reaction lasting at least eight hours and typically lasting anywhere between 24-48 hours with an average temperature maintained between 30° C. and 10° C. More accurate control for highly temperature sensitive materials may be provided where the heat generating packaging material 10 in integrated into or used to produce the shipping package. Thus, air permeation can more accurately be predicted and controlled. The shipping package may be an envelope, a box, or other container, for example. The air permeation rate may be further controlled by forming a plurality of apertures in an outer surface of the shipping package.

[0017] The invention militates against a freezing or other temperature damage to temperature sensitive products contained in the shipping package when shipped in the winter season or other times of cold outdoor temperatures. It has been determined that the invention is especially useful in the shipping of temperature sensitive pharmaceutical products such as injectables, for example, that can freeze or otherwise become damaged in cold temperatures. Additionally, the coating applied to the air-permeable covering 12 militates against damage to the heating agent 18, such as by a chemical reaction as a result of condensation contacting the heating agent 18.

[0018] While there is shown a heat generating packaging material 10 forming a substantially rectangular shape, it is understood that packets forming other shapes can be formed without departing from the scope or spirit of the invention. For example, a packet could be formed having a plurality of apertures or pockets formed therein for receiving items, such as pharmaceutical bottles, for example. Additionally, the heat generating packaging material 10 could be formed wherein a substantially rigid backing is joined with the air-permeable covering 12 to aid in protecting the heating agent and or contents of the package from physical damage. The backing can also be used to cause the heat generating packaging material 10 to maintain a desired shape. For example, the heat generating packaging material 10 can be produced in a shape adapted to receive a bottle therein. Insulating material and other materials can also be used to further aid in temperature control or to mitigate against physical damage to the material being shipped.

[0019] From the foregoing description, one ordinarily skilled in the art can easily ascertain the essential characteristics of this invention and, without departing from the spirit and scope thereof, can make various changes and modifications to the invention to adapt it to various usages and conditions.

What is claimed is:
1. A heat generating packaging material comprising:
   - a heating agent; and
   - an air-permeable covering enclosing the heating agent,
     the covering having an air permeability per unit time of between 10000 and 25000 sec/100 cc resulting in a reaction of the heating agent lasting up to 48 hours.

2. The packaging material according to claim 1, further comprising a backing material disposed on at least a portion of the covering.

3. The packaging material according to claim 2, wherein the backing material is cardboard.

4. The packaging material according to claim 1, wherein the packaging material is adapted to form a shipping container.

5. The packaging material according to claim 4, wherein an outer surface of the shipping container includes a plurality of apertures formed therein.

6. The packaging material according to claim 4, wherein the shipping container is an envelope.

7. The packaging material according to claim 4, wherein the shipping container is a box.

8. The packaging material according to claim 1, wherein the heating agent includes at least one of metal powder, water, water-retaining agent, activated carbon, and salt.

9. The packaging material according to claim 8, wherein the water-retaining agent is wood flour.

10. The packaging material according to claim 1, wherein generation of heat by the heating agent lasts between 24 and 48 hours.

11. The packaging material according to claim 8, wherein the metal powder is iron powder.

12. The packaging material according to claim 1, wherein the heating agent includes by weight 55-65% metal powder, 15-22% of water, 9-11% water-retaining agent, 3.5-4.5% activated carbon, 4.5-6% salt.

13. The heat packet according to claim 1, wherein the air-permeable covering includes a coating applied thereto.

14. A heat generating packaging material comprising:
   - a heating agent consisting essentially of metal powder, water, water-retaining agent, activated carbon, and salt; and
   - an air-permeable covering enclosing the heating agent,
     the covering having an air permeability per unit time of between 10000 and 25000 sec/100 cc resulting in a reaction of the heating agent lasting up to 48 hours.

15. The packaging material according to claim 14, further comprising a backing material disposed on at least a portion of the covering.

16. The packaging material according to claim 14, wherein the packaging material is adapted to form a shipping container.

17. A method of maintaining a desired temperature in a shipping package comprising the steps of:
   - providing a heat generating packaging material having a heating agent disposed in an air-permeable covering,
     the covering having an air permeability per unit time of between 10000 and 25000 sec/100 cc resulting in a reaction of the heating agent lasting up to 48 hours; and
disposing the heat generating packaging material in the
shipping package to maintain the package within the
desired temperature range.

18. The method according to claim 17, further comprising
the steps activating a chemical reaction by exposing the
air-permeable bag to oxygen and of reducing oxygen expo-
sure to the air-permeable bag by sealing the shipping pack-
age by any conventional means.

19. The method according to claim 17, further comprising
the steps providing a backing material and disposing the
backing material on at least a portion of the covering.

20. The method according to claim 17, further comprising
the steps forming the shipping package into a desired shape.

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