(54) Title: MATERIAL FOR PACKAGING PURPOSES

(57) Abstract: The present invention relates to a material for packaging purposes, which material comprises a first layer composed of thermoplastic polymer, a second layer composed of thermoplastic polymer and an intermediate barrier layer in the form of a primer, where one of the said first and second layers exhibits an oxygen permeability (OTR) which is greater than 6.0 and less than 45 cm³/m² day atm at 23 °C, 50 % relative atmospheric humidity and on a plane sheet, and the said barrier layer in the form of primer on either one of the layers contributing to the said material exhibiting an OTR which is less than 9.0 cm²/m² day atm and the said primer layer exhibiting adhesion against the said non-primer-treated layer and the ability to be heat-sealed against polyolefin systems and polyester systems, and to a process for producing the said material, and to a process for packaging using the said material.
Material for packaging purposes

TECHNICAL FIELD
The present invention relates to a material for packaging purposes, which material comprises a first layer and a second layer composed of thermoplastic polymer and an intermediate barrier layer, with the said first or second layer having been treated with a barrier layer composition in the form of a primer and, in connection with this, a barrier layer having been formed on the treated layer. The invention furthermore relates to a process for producing the said material and to a process for packaging, with the said material being used.

BACKGROUND ART
EP, A2, 0254468 describes a composite structure which comprises a synthetic thermoplastic polymeric basal layer and which has two layers on one side of the polymeric basal layer, with the layer closest to the polymeric basal layer being a urethane primer layer which in turn possesses a layer of a gas barrier material composed of polyvinyl alcohol. Examples of materials for the polymeric basal layer are polyester and also nylon, which materials can be in the form of film. In addition, a polyethylene layer which is laminated to the polyvinyl alcohol layer is also obtained in one embodiment.

In addition, US, A, 6086991 describes a method for uniformly covering a polyester substrate with a water-borne inorganic barrier layer composition, with this method including first applying a primer composition and then applying a barrier layer composition. Furthermore, polyvinyl alcohol is used and the products which are obtained can be provided with a heat sealing layer which is composed, for example, of ethylene propylene copolymer or ethylene propylene butylene terpolymer.

There is a great need for new materials for packaging purposes which optimize all use of resources and which, at the same time, retain the desired
performance. Neither these needs nor these solutions have been met in the existing materials for packaging purposes.

DISCLOSURE OF INVENTION

The present invention relates to a material for packaging purposes, which material comprises a first layer composed of thermoplastic polymer, a second layer composed of thermoplastic polymer and an intermediate barrier layer in the form of a primer, wherein one of the said first and second layers exhibits an oxygen permeability (OTR) which is greater than 6.0 and less than 45 cm³/[m² day atm] at 23° C, 50% relative atmospheric humidity and on a plane sheet, that the said barrier layer in the form of primer on either one of the layers contributes to the said material exhibiting an OTR which is less than 9.0 cm³/[m² day atm], and that the said primer exhibits adhesion against the layer which has not been treated with primer and which has the ability to be heat-sealed against polyolefin systems and polyester systems.

The said material is expediently a flexible material in film or sheet form which can be used in packaging, for example in packaging comprising the use of welding tools for sealing, such as heated jaws or other energy-transferring tools.

Furthermore, the said first layer can, for example, be composed of amorphous polyester, expanded polyester or oriented polyamide. The said first layer can be a layer which can be thermoformed or is heat resistant.

The said second layer can, for example, be composed of polyethylene or polypropylene, which is expedient when the ability to be heat-sealed against polyolefin systems is desired, and have a thickness of from 20 to 80 μm. If the said second layer is heat-sealable, the said second layer can, like other heat-sealable layers, be heat-sealed to an object by, for example, using welding tools such as heated jaws. The said object is, for example, composed of the same material as the said first layer, for example
amorphous polyester. Polyolefin systems can comprise, for example, polyethylene (PE) or polypropylene (PP). When the said second layer is composed of polyethylene, it can also give a "peel" effect, which means that packages comprising this "peel" effect can be torn open.

The barrier layer composition in the form of a primer comprises an adhesion component and a barrier component.

In addition, the said first layer exhibits an oxygen permeability (OTR) which is greater than 6.0 and less than 45 cm\(^3\)/[m\(^2\) day atm] at 23°C, 50% relative atmospheric humidity and on a plane sheet, which, together with the said barrier layer, contributes to the finished material exhibiting an OTR which is less than 9.0 cm\(^3\)/[m\(^2\) day atm].

The said barrier layer acts as a barrier to gas and/or vapour. It has been found that the said barrier layer can be efficiently formed on the said first or second layer by means of treating with a barrier layer composition in the form of a primer. As a result of the said material, the quantity of components in the finished material, and the number of mechanical operations in manufacturing it, have decreased as compared with previously known equivalent materials. While, in this case, "quantity" means quantity in the usual sense, it can also mean number. Furthermore, in this case "components" means everything which is included in the finished material in accordance with the present invention and in every specific, previously known, equivalent material.

Moreover, as a result of the said material, the quantity of manufacturing components and the number of manufacturing steps which are included in the production of the said material have decreased as compared with what is included in producing previously known materials. In this case, "quantity" is defined as previously and "manufacturing components" are defined as "components" were defined previously but as, instead, being included in the manufacture of the material. By means of selecting, in the said material,
specific thermoplastic polymers as manufacturing components for the said first layer, with the said first layer exhibiting an oxygen permeability (OTR) which is greater than 6.0 and less than 45 cm$^3$/[m$^2$ day atm], a perfect balance has been reached between the extent of the oxygen barrier in the first layer and the occurrence of small areas which lack primer in the said barrier layer. These can be likened to "pinholes" in the barrier layer which decrease the barrier properties of the barrier layer and which arise when the barrier layer is formed on the first or second layer. In this case, a perfect balance means that the oxygen permeability (OTR) of the said first layer, taken together with the occurrence of "pinholes" in the said barrier layer, makes a negligible contribution to the oxygen permeability (OTR) of the said material, at the same time as it has been possible to avoid using more expensive manufacturing components, with an even lower oxygen permeability (OTR), for manufacturing the first layer. In other words, manufacturing components which possess barrier properties which are "just good enough" have been selected for the said first layer.

The oxygen permeability (OTR) of the said first layer is, for example, approximately 18 cm$^3$/[m$^2$ day atm], as in certain amorphous or expanded polyester, and "pinholes" constitute approximately 10% of the said barrier layer. Consequently, the contribution which the oxygen permeability (OTR) of the said first layer, taken together with the "pinholes" in the said barrier layer, makes to the oxygen permeability (OTR) of the said material, in a material in accordance with the present invention, is approximately 1.8 cm$^3$/[m$^2$ day atm]. If polypropylene, which has an oxygen permeability (OTR) of approximately 2500 cm$^3$/[m$^2$ day atm], were to be used instead in the first layer, the corresponding contribution then becomes approximately 250 cm$^3$/[m$^2$ day atm], which results in a material with poor barrier properties. Accordingly, if manufacturing components, for example oriented PET or oriented polypropylene (PP), which have oxygen permeabilities (OTR) which are too high, were to be selected for the said first layer in a material for
packaging purposes, a material would be obtained which had an OTR which was very high, i.e. substantially greater than 9.0 cm³/[m² day atm].

Furthermore, it has also been found that the said material in accordance with the present invention can be produced in one step and in connection with this, it is possible, using very simple means, to obtain a material having a low OTR. The said material has also been found to have properties which make the material suitable for welding, for example in packaging using the material.

A material in accordance with the present invention surprisingly results, for the first time, in a material for packaging purposes which, in one and the same material, possesses, or brings about, all the above-described advantageous properties, i.e.

that the said first layer exhibits "good-enough" barrier properties, i.e. an oxygen permeability (OTR) which is greater than 6.0 and less than 45 cm³/[m² day atm] at 23°C, 50% relative atmospheric humidity and on a plane sheet, and that the said barrier layer contributes to the said material exhibiting an OTR which is less than 9.0 cm³/[m² day atm].

a decrease in the quantity of components, manufacturing components and number of operations or manufacturing steps which are included in its production,

the ability to be heat-sealed against polyolefin systems, and

suitability for being processed by welding.

It is necessary for the OTR of the said first layer to be less than 45 cm³/[m² day atm], which means that the layer in itself exhibits relatively good barrier properties, in order to obtain a material which contains the said barrier layer produced on the said first or second layer with the material
having an OTR which is less than 9.0 cm$^3$/[m$^2$ day atm]. If the said first layer instead exhibits barrier properties which are too poor, i.e. if the layer is a layer having an OTR which is frequently substantially greater than 45 cm$^3$/[m$^2$ day atm], materials containing barrier layers are then obtained, which materials have an OTR which is substantially greater than 9.0 cm$^3$/[m$^2$ day atm]. Materials which have an OTR which is greater than 9.0 cm$^3$/[m$^2$ day atm] exhibit performances which are inadequate for many packaging purposes.

In the present invention, the OTR of the said material is calculated in accordance with the following formula:

\[
\frac{1}{\text{OTR of the material}} = \frac{1}{\text{OTR of the first layer}} + \frac{1}{\text{OTR of the barrier layer}}
\]

Another embodiment relates to a material for packaging purposes in accordance with the present invention, with one of the said first and second layers exhibiting an oxygen permeability (OTR) which is greater than 10 and less than 30 cm$^3$/[m$^2$ day atm] at 23°C, 50% relative atmospheric humidity and on a plane sheet.

Another embodiment according to the present invention relates to a material, with the said material exhibiting an OTR which is less than 8.0 cm$^3$/[m$^2$ day atm].

One embodiment according to the present invention relates to a material, with the said primer-treated layer being composed of amorphous polyester and the said primer-treated layer then being able, for example, to have a thickness which lies in an interval from 90 to 800 μm.

Another embodiment according to the present invention relates to a material, with the said primer-treated layer being composed of expanded polyester and
with the said primer-treated layer then being able, for example, to have a thickness which lies in an interval from 300 to 1000 μm.

Another embodiment according to the present invention relates to a material, with the said primer-treated layer being composed of oriented polyamide and with the said primer-treated layer then being able, for example, to have a thickness which lies in an interval from 8 to 100 μm.

Another embodiment according to the present invention relates to a material, with the said non-primer-treated layer being composed of polyethylene, polypropylene or polyester.

Yet another embodiment according to the present invention relates to a material, with the said non-primer-treated layer having a thickness which lies in an interval from 20 to 80 μm.

In addition, the present invention relates to a process for producing a material which has been described in this present document, with the said process comprising forming the said first layer and the said second layer using conventional techniques and, after that, forming the said barrier layer on the said first layer or second layer by treating the said first or second layer with the said primer, with the first and second layers being laminated to each other with the barrier layer lying in between them.

Another embodiment according to the present invention relates to a process in which the said treatment comprises a primer installation. The primer installation can comprise a press roller and the barrier primer composition can, for example, be soluble in water and/or soluble in alcohol.
The present invention also relates to a process for packaging, with a material which has been described in this present document being used for the said process.

Furthermore, the said process for packaging using the said material can comprise, for example, thermoforming, heat-sealing against a compatible material, for example a packaging tray, welding and/or the like.

IMPLEMENTATION EXAMPLES

Example 1

Manufacturing a material for packaging purposes, which material comprises a first layer composed of amorphous polyester, a second layer composed of polyethylene and a barrier layer in the form of a primer between said first and second layers.

A conventional technique is firstly used to form a first layer which has a thickness of 300 μm and which is composed of amorphous polyester, after which a barrier layer is formed on the first layer by treating the first layer with a primer which comprises an adhesion component and a barrier component. After that, a conventional technique is used to form a second layer which has a thickness of 40 μm and is composed of polyethylene, with the second layer being laminated to the barrier layer.

Example 2

Manufacturing a material for packaging purposes, which material comprises a first layer composed of expanded polyester, a second layer composed of polyethylene and a barrier layer in the form of a primer between said first and second layers.
The material in Example 2 was manufactured in the same way as the material in Example 1 except that, in this present case, the first layer has a thickness of 800 μm and is composed of expanded polyester.

Example 3

Manufacturing a material for packaging purposes, which material comprises a first layer composed of oriented polyamide, a second layer composed of polyethylene and a barrier layer in the form of a primer between said first and second layers.

The material in Example 3 was manufactured in the same way as the material in Example 1 except that, in this present case, the first layer has a thickness of 12 μm and is composed of oriented polyamide.
CLAIMS

1. Material for packaging purposes, comprising a first layer composed of thermoplastic polymer, a second layer composed of thermoplastic polymer and an intermediate barrier layer in the form of a primer, characterized in that one of the said first and second layers exhibits an oxygen permeability (OTR) which is greater than 6.0 and less than 45 cm$^3$/[m$^2$ day atm] at 23° C, 50% relative atmospheric humidity and on a plane sheet, in that the said barrier layer in the form of primer on either one of the layers contributes to the said material exhibiting an OTR which is less than 9.0 cm$^3$/[m$^2$ day atm], and in that the said primer exhibits adhesion against the layer which has not been treated with primer and which has the ability to be heat-sealed against polyolefin systems and polyester systems.

2. Material according to claim 1, characterized in that the said material exhibits an OTR which is less than 8.0 cm$^3$/[m$^2$ day atm].

3. Material according to any one of claims 1 or 2, characterized in that the said primer-treated layer is composed of amorphous polyester.

4. Material according to claim 3, characterized in that the said primer-treated layer has a thickness which lies in an interval from 90 to 800 μm.

5. Material according to any one of claims 1 or 2, characterized in that the said primer-treated layer is composed of expanded polyester.

6. Material according to claim 5, characterized in that the said primer-treated layer has a thickness which lies in an interval from 300 to 1000 μm.
7. Material according to any one of claims 1 or 2, characterized in that the said primer-treated layer is composed of oriented polyamide.

8. Material according to claim 7, characterized in that the said primer-treated layer has a thickness which lies in an interval from 8 to 100 μm.

9. Material according to any one of the preceding claims, characterized in that the said non-primer-treated layer is composed of polyethylene, polypropylene or polyester.

10. Material according to claim 9, characterized in that the said non-primer-treated layer has a thickness which lies in an interval from 20 to 80 μm.

11. Process for producing a material according to any one of the preceding claims, characterized in that the said process comprises using conventional techniques to form the said first layer and the said second layer and, after that, forming the said barrier layer on the said first layer or second layer by treating the said first or second layer with the said primer, with the first and second layers being laminated to each other with the barrier layer lying between them.

12. Process according to claim 11, characterized in that the said treatment comprises a primer installation.

13. Process for packaging, characterized in that a material according to any one of claims 1 to 10 is used for the said process.
INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 03/01324

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B65D 65/40, B32B 27/00, C08J 7/04
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B32B, B65D, C08J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP/DOC, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Relevant to claim No.</th>
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Further documents are listed in the continuation of Box C. See patent family annex.

Date of the actual completion of the international search

17 Sept. 2003

Date of mailing of the international search report

20-10-2003

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer
Barbro Nilsson/Els
Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)
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# INTERNATIONAL SEARCH REPORT

## Box I  Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. □ Claims Nos.:
   because they relate to subject matter not required to be searched by this Authority, namely:

2. □ Claims Nos. **1-13 (in part)**
   because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
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   see next page
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3. □ Claims Nos.:
   because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II  Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. □ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. □ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. □ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. □ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

## Remark on Protest

 □ The additional search fees were accompanied by the applicant’s protest.

 □ No protest accompanied the payment of additional search fees.

*Form PCT/ISA/210 (continuation of first sheet (1)) (July 1998)*
Present claims 1-13 relate to a product and a method defined by reference to a desirable property, namely that a barrier layer in form of a primer presents a material with an OTR less than 9,0 cm³/[(m² dag atm)]. The claims cover all products and methods having this property. In the present case, the claims so lack support, and the application so lacks disclosure, within the meaning of Article 5 PCT, that a meaningful search over the whole of the claimed scope is impossible. Independent of the above reasoning, the claims also lacks clarity (Article 6 PCT). An attempt is made to define the product and method by reference to a result to be achieved. Again, this lack of clarity in the present case is such as to render a meaningful search over the whole of the claimed scope impossible. Consequently, the OTR value has been ignored and the search has been carried out for the remainder of the claims namely a laminate for packaging comprising an intermediate barrier layer having both barrier and adhesion properties.
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