PROTECTIVE GLOVE HAVING TEXTILE INNER LINING

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ABSTRACT

The present disclosure relates to a polymer protective glove, which includes a textile lining and a polymer layer having an elastomer with isoprene units. According to the present disclosure, the textile lining or textile layer and the polymer layer are embodied in the form of a layered laminate. The present disclosure also relates to a method for manufacturing such a protective glove.
Fig. 1:

Fig. 2:

Fig. 3:
PROTECTIVE GLOVE HAVING TEXTILE INNER LINING

TECHNICAL FIELD

[0001] The present disclosure relates to protective gloves, in particular elastic, polymeric protective gloves with a textile lining, as well as to a method for their manufacture.

BACKGROUND

[0002] Because of the availability of a number of suitable polymers, it is possible to obtain protective gloves for a large number of chemical substance classes. It is thus possible, depending on the polymer or polymeric composite materials used, to obtain long permeation times for different substance classes. In particular, elastomers such as isoprene rubbers also feature a low gas permeability, which is desirable from a safety standpoint. Consequently, however, protective gloves composed of polymeric materials are not breathable, i.e. the moisture generated by perspiration remains inside the glove. This has a significant negative impact on the wearing comfort of such a protective glove, particularly when it is worn for long periods. To improve the wearing properties, in particular to absorb moisture, therefore, textile inner gloves are generally used. The use of a textile inner glove and a separate polymeric protective glove, however, is disadvantageous for practical reasons. On the one hand, it takes a relatively long time to put on the inner glove and the protective glove. On the other hand, the use of two gloves results in a relatively large overall thickness of the glove combination, which has a disadvantageous effect on tactile sensitivity. There is also often a lot of play, i.e. space between the textile inner glove and the polymeric glove, which likewise has a disadvantageous effect on tactile sensitivity.

[0003] There is thus an interest in polymeric protective gloves with a fixed textile lining. In this connection, there are protective gloves known from the prior art in which the textile lining is glued into the polymeric protective glove, i.e. an adhesive agent is used to affix the lining in the glove. The textile lining and the polymeric material, however, do not have a common phase boundary and the adhesion is produced by means of the adhesion and cohesion forces of the adhesive agent, for example a glue. The gluing process is disadvantageously complex and the textile lining and polymeric glove can not be washed out from each other relatively easily. The latter is particularly true when the bonding agent is washed out over the course of the wearing life or is subject to other external influences.

[0004] By contrast, a protective glove made of a composite material composed of a textile knitted fabric and a polymer layer has a more powerful adhesion between the textile knit and the polymer layer.

[0005] German patent disclosure DE 27 59 008 A1 describes a protective glove composed of a textile that has been coated by means of a dip-coating process from a dispersion with polymers such as polyvinyl chloride (PVC) and also describes its manufacturing method and an apparatus conceived for this purpose. Due to the irregular layer thicknesses and the occurrence of diffusion conduits, so-called “pin holes,” a protective glove of this kind has a comparatively poor protective effect. This is also disadvantageous from an economic standpoint because it results in a larger number of rejects. It also requires the use of additives such as coagulation reagents.

GENERAL DESCRIPTION

[0006] The object of the present disclosure is to create a polymeric protective glove with a textile lining, which has uniform permeation times across the entire surface of the glove and thus has a reliable protective effect in relation to a variety of chemical compound classes.

[0007] Another object is to create a glove of this kind that also has a high level of wearing comfort while maintaining flexibility and tactile sensitivity. Another object is to create an efficient method for manufacturing a protective glove of this kind.

[0008] This object is attained by the subject of the independent claims. Other embodiments and modifications are disclosed in the respective dependent claims.

[0009] Accordingly, the present disclosure provides a polymeric protective glove with a textile lining in which the textile lining and at least a first polymer layer are embodied in the form of a layered laminate. The first polymer layer includes a synthetic elastomer, which is embodied in the form of a copolymer with isoprene as a monomer unit, i.e. the elastomer contains isoprene monomer units. In the context of the present disclosure, copolymers are understood to be polymers with at least two different monomer units. An isoprene monomer unit is understood in particular to be the repeating unit 1. Polymers with isoprene monomer units are understood to also include those polymers in which derivatives of isoprene monomer units are present. In particular, such polymers are understood to be polymers with isoprene monomer units in which a derivatization has taken place by means of polymer analogous reactions such as halogenation of the polymer.

[0010] The textile layer of the layered laminate forms the inside of the glove and is understood to be the bottom (innermost) layer. Consequently, the first polymer layer, like optional, subsequent additional polymer layers situated over the said layer, i.e. relative to the glove as it is worn by the user, is situated toward the outside. The layered laminate is constructed so that the textile layer and the first polymer layer are firmly bonded to each other by means of a common boundary layer. The textile layer here can, for process-related reasons, also contain additives or residual amounts of additives such as sizing agents or film-forming substances, in particular polyvinyl alcohol (PVA) or polysaccharides such as starch.

[0011] In a preferred embodiment of the present disclosure, the textile layer and the first polymer layer are held together by a fiber reinforced material layer, i.e. a fiber/synthetic composite. This permits good adhesion of the first polymer layer to the textile lining or textile layer. In particular, it is thus possible to dispense with using an adhesive agent, in particular a glue. The textile properties of the textile lining are thus largely preserved.

[0012] On the common boundary layer, the lining and polymer layer form a fiber reinforced material in which the fibers of the textile layer are embedded into a matrix of the polymer of the first polymer layer. The fiber reinforced material is produced when the textile lining or textile layer is dipped into a solution of a synthetic rubber with isoprene monomer units.
At the boundary layer of the two layers, the polymer solution penetrates into the textile layer and envelops the fibers. The textile layer is thus at least partially penetrated by the polymer layer. An entanglement of the textile fibers with the polymer chains occurs. This increases the contact area between the fibers and the polymer chains and thus also increases the inter- and intramolecular forces of attraction that can be due to interactions such as van-der-Waals forces or adhesion effects.

[0013] Preferably, the textile lining is composed of a knit fabric. It may be desired that, in addition to the first polymer layer, the textile layer or textile lining is elastic.

[0014] The knitted fabric preferably is a knitted fabric with double loops; an interlock knitted fabric is particularly preferable. This may produce a fiber reinforced material while preserving the textile properties of the lining since the knitted fabric has a sufficient mesh density, which has a positive effect on the degree of impregnation of the textile lining.

[0015] In an embodiment of the present disclosure, the knitted fabric of the textile lining contains cellulose-containing fibers. It may be desired that the knitted fabric is composed of cotton or a cotton blend fabric, in particular with a cotton content of greater than 50%. This may be desirable because natural fibers, in particular cellulose-containing fibers, are particularly able to absorb moisture due to their swelling capacity.

[0016] In an embodiment, the cotton fabric has a density of greater than 150 g/m², in particular greater than 250 g/m². The yarn size of the fabric is preferably 30:1. It has turned out that the penetration of the textile lining can be influenced by means of the density of the knitted fabric in combination with the yarn size.

[0017] In one embodiment of the present disclosure, the first polymer layer contains an elastomer with butyl monomer units. It is thus possible to achieve a protective effect in relation to a multitude of compound classes. Thus, elastomers with isoprene monomer units such as cross-linked butyl rubbers (IIR), in particular elastomers with butyl monomer units, have a good protective effect in relation to polar solvents and in relation to acids and bases. Low glass temperatures $T_g$ result in a very good flexibility, even at low temperatures. Moreover, elastomers with isoprene units have a low gas permeability, i.e., they are impermeable to a multitude of gases such as hydrogen chloride or ammonia.

[0018] In a preferred embodiment of the present disclosure, the first polymer layer contains an elastomer with halogenated butyl monomer units, in particular an elastomer with butyl monomer units that has been halogenated in a polymer analogous reaction. It is particularly preferable for the first polymer layer to contain an elastomer with bromobutyl monomer units; in the context of the present disclosure, bromobutyl monomer units are understood in particular to be the repeating units II, III, and IV.

[0019] Compared to their pure hydrocarbon derivatives, halogenated butyl rubbers are easier to cross-link because of their lower bond energies. This effect is particularly pronounced in rubbers with bromobutyl monomer units. In addition, halogenation of the butyl rubber increases its chemical inertness and thus increases the protective effect of the glove.

[0020] According to one embodiment of the present disclosure, the first polymer layer is applied to the textile layer by means of a dip-coating process, i.e., a dipping process, in particular a dip-coating process from a solution. This makes it possible to dispense with additives such as coagulation reagents. In addition, polymer layers applied by dip-coating processes from solutions have consistent layer properties. It is thereby possible to ensure constant permeation times over the entire glove and thus a reliable protection. It is likewise possible to avoid the occurrence of so-called pin holes, i.e., diffusion conduits, in the polymer layer.

[0021] Preferably, the first polymer layer is composed of a two polymer sublayers: the first polymer sublayer contains no colorant, the second polymer sublayer contains colorant, and the second polymer sublayer is disposed onto the first polymer sublayer. This embodiment of the first polymer layer may provide uncolored, i.e., light-colored, textile linings that are typically used for protective gloves. Because an uncolored first polymer sublayer is used, the sublayer glints through the textile lining without influencing the color impression of the lining. On the other hand, users especially prefer protective gloves in which colorants have been added to the polymer layer; hence, the established position of such gloves in the marketplace.

[0022] In another modification of the present disclosure, at least one second polymer layer of another, different polymer is applied over the first polymer layer. In another preferred embodiment, the second polymer layer contains a fluorinated elastomer. Repulsive, i.e., repelling, interactions sharply reduce an adsorption of molecules on the layer surface, thus increasing the resistance to a large number of chemical substance classes. Consequently, the comparatively high grease, oil, and fuel permeability of the first polymer layer’s elastomer with isoprene monomer units can be compensated for through combination with the second polymer layer.

[0023] Such a protective glove made of a composite material of different polymer layers, in particular a layered laminate composed of an isoprene elastomer and a fluoroelastomer, due to synergistic effects, offers a broader range of protection, i.e., high permeation times for a large number of compound classes, than corresponding protective gloves with only one polymer layer.

[0024] In yet another modification of the present disclosure, the second polymer layer contains an elastomer with 1,1-difluoroethylene monomer units. Fluoroelastomers with 1,1-difluoroethylene monomer units are inert in relation to
many chemicals, oils, and fuels and are heat resistant. The high tear resistance of up to 20 MPa of fluororubbers with 1,1-difluoroethylene monomer units also results in a high mechanical resistance of the polymer composite material.

[0025] In a further embodiment of the present disclosure, the second polymer layer contains a copolymer with the monomers 1,1-difluoroethylene and hexafluoropropene.

[0026] In another preferred embodiment according to the present disclosure, the second polymer layer contains an elastomer with acrylonitrile monomer units such as a cross-linked nitrile rubber (NBR).

[0027] Preferably, the protective glove has a first polymer layer with a thickness of 0.05 mm to 0.5 mm and/or a second polymer layer with a thickness of 0.05 mm to 0.15 mm. This has a good effect on permeation times, flexibility, and wearing comfort.

[0028] The manufacturing method is composed of at least the following steps:

[0029] In step a), a textile lining is placed onto a glove form. In this case, an anti-friction agent may be used, such as a silicone oil, which is applied to the glove form in advance. In the next step b), a solution of a film-forming polymer is applied to the textile lining that has been placed onto the glove form. In order to produce a first polymer layer, in step c), a glove form is dipped into a first solution of a synthetic, first rubber. In order to prevent a cross-linking of the rubber either in the solution or immediately after removal of the form, the temperature T1 during the dip-coating procedure is lower than the cross-linking temperature of the first rubber. After a predefined dipping time, i.e. immersion time, the glove form is removed from the first solution (step d). Steps e) and d) are carried out once or several times in sequence. The dipped first polymer layer is dried (step e). Preferably, the drying time is at least 8 hours. Then in step f), the first polymer layer is vulcanized by autoclaving the protective glove. In the next step g), the protective glove is removed from the form.

[0030] In another embodiment of the method according to the present disclosure, in step c), the glove form is dipped into a first solution of a butyl rubber, preferably a first solution of a halogenated butyl rubber, and particularly preferably a first solution of a rubber with bromobutyl monomer units.

[0031] In a modification of the present disclosure, after step e), the glove form is dipped into a second solution of a second, other synthetic rubber. After a predefined dipping time t2, the glove form is removed from the solution and dried. In particular, the first and second polymer layers are jointly vulcanized in step f).

[0032] The second solution may contain a rubber with the monomers 1,1-difluoroethylene and/or hexafluoropropene. This has a positive effect on the properties of the glove, for example on the permeation times for a multitude of chemical compound classes.

[0033] Usually in the solvent dipping process, i.e. a dip-coating process from a solution, however, longer immersion times are required than in the corresponding dispersion process. When a textile lining is dipped for a long time, this typically results in a partial or even total penetration of the textile lining and thus in a loss of the desired textile properties of the lining. Pre-treating the lining with a film-forming polymer can prevent a complete impregnation of the textile lining, even with longer dipping times. It is thus possible to dip polymer layers into solutions while still maintaining the desired textile properties of the lining.

[0034] In particular, polar polymers with hydroxyl groups are used as film-forming polymers. Preferably, these polymers are water-soluble. In particular, a PVA solution and/or a polysaccharide-containing solution such as a starch-containing solution are used as a solution of a film-forming polymer. Preferably a plasticiser, in particular glycerine, is added to the film-forming polymer solution.

[0035] Surprisingly, it occurred that according to one embodiment, a spraying or a single or multiple brushing or dabbing of the textile lining with a cloth impregnated with the solution of the film-forming polymer can prevent a complete penetration with the rubber solution. It is thus possible to prevent a complete penetration of the textile lining. This effect is particularly pronounced with cellulose-containing textiles. Cellulose-containing fibers such as cotton fibers swell significantly in the presence of moisture and absorb the moisture. The application of the film-forming polymer thus makes it possible to optimally pre-treat these fibers for the subsequent dip-coating procedure.

[0036] In one embodiment, before being dipped into the first solution of a rubber with isoprene units, the textile lining is brushed with the PVA solution until the amount of application of PVA onto the lining totals 0.15 to 3 g, preferably 0.5 to 1.8 g, particularly preferably 0.6 to 0.9 g. It is thus possible to influence the degree to which the rubber impregnates the textile lining.

[0037] According to an alternative embodiment, the textile lining is sprayed with a solution containing a polysaccharide such as starch. This solution preferably functions as a sizing agent. The use of a polysaccharide, in particular starch, as a film-forming polymer has the advantage that the protective glove does not stick very powerfully to the glove form. As a result, after production, the glove can surprisingly be removed from the glove form even without turning it inside out, which significantly improves the production process.

[0038] In one embodiment of the method according to the present disclosure, the viscosity of the first rubber solution is from 100 to 200 s (determined with a 6 mm Ford beaker). This is good because a rubber solution with a high viscosity, due to its flow behavior, penetrates more slowly into the textile lining than corresponding solutions with lower viscosities. Consequently, the selection of the viscosity of the first rubber solution constitutes a further parameter which, in combination with the film-forming polymer, can be used to influence the degree of penetration.

[0039] In a modification of the present disclosure, the textile lining is dipped into two different solutions of the same first synthetic rubber, which differ in terms of their viscosities. First, the textile lining is dipped according to process steps c) and d) into a solution of the first synthetic rubber with a high viscosity. This produces a first polymer sublayer, which does not completely penetrate the textile layer and seals the surface of the textile lining on the outside. In the subsequent dip-coating according to process steps c) and d), the dipping takes place in a second solution of the first synthetic rubber with a lower viscosity, thus contributing to a further build-up of the first polymer layer. This is good for process-related reasons since rubber solutions with comparably low viscosities are easier to work with when dip-coating from a solution.

[0040] In at least one of the dip-coating procedures, the glove form is preferably dipped partially at least once and then is dipped all the way. This makes it possible to achieve uniform layer thicknesses also with glove forms in which this
would not otherwise be possible due to their geometry, for example in glove forms with sleeves that widen out in the direction of the glove opening. The partial dipping is also desired in terms of the degree of penetration of the textile layer. By initially pre-dipping only the hand region, it is possible to select a reduced dipping depth. As a result, the hydrostatic pressure is lower during the first dip-coating procedure. This effect is particularly observable at the finger tips. Each dip-coating procedure of the glove form into the same rubber solution produces another layer of the rubber, which is referred to as a dipped polymer sublayer. After a dipped polymer sublayer has been deposited in the first partial dipping procedure, which seals the textile lining up to approximately the wrist, then a full dipping can occur, i.e. with a higher hydrostatic pressure at the fingers, without this disadvantageously affecting the impregnation depth of the textile lining.

[0041] A preferred embodiment of the present disclosure provides a method in which the polymer layers are dipped as often and for as long as necessary until the first polymer layer has reached a thickness of 0.05 to 0.5 mm and/or the second polymer layer has reached a thickness of 0.05 to 0.2 mm.

[0042] The vulcanization of the first polymer layer preferably occurs by means of autoclaving at a pressure of 3 to 5 bar and/or at a temperature of 60 to 170°C, in particular at a temperature of 90 to 150°C. A cross-linking of rubbers into elastomers increases their mechanical resistance significantly. In addition, the cross-linking reduces the permeation rates within the cross-linked polymer layers.

[0043] The removed protective gloves may be washed with water to which tensides have preferably been added. Residues of PVA and/or starch that are not enveloped by the first polymer layer can thus be at least partially removed from the textile lining. However, one advantage in the use of starch as a film-forming polymer lies in the fact that it is possible to dispense with the use of rinsing agents when removing the protective glove from the glove form. Furthermore, the starch can remain in the textile lining without a significant, negative impact on the wearing comfort, so that it is possible to dispense with an additional step of washing out the finished protective glove, thus making it possible to increase productivity.

[0044] The present disclosure will be described in greater detail below in conjunction with an illustrative embodiment and with reference to the figures; some elements that are the same or similar have been provided with the same reference numerals.

BRIEF DESCRIPTION OF THE FIGURES

[0045] FIG. 1 is a schematic depiction of the manufacturing method of the first illustrative embodiment.
[0046] FIG. 2 is a schematic depiction of the manufacturing method of the second illustrative embodiment.
[0047] FIG. 3 is a schematic depiction of the manufacturing method of the third illustrative embodiment.
[0048] FIG. 4 is a schematic depiction of the protective glove according to the present disclosure.
[0049] FIG. 5 is a schematic cross-section through the composite material of a protective glove with the glued-in textile lining.
[0050] FIG. 6 is a schematic cross-section through the detail A of the first illustrative embodiment.
[0051] FIG. 7 is a schematic cross-section through the detail A of the second illustrative embodiment, and

[0052] FIG. 8 is an optical microscope image of the cross-section through the detail A of the first illustrative embodiment.

DETAILED DESCRIPTION

[0053] FIG. 1 schematically depicts the manufacturing method of a protective glove 16 in conjunction with the first illustrative embodiment. FIG. 2 shows a simplified form of the manufacturing method, which is explained in greater detail in conjunction with a second illustrative embodiment. FIG. 3 shows another embodiment of the manufacturing method. FIG. 4 is a schematic depiction of the protective glove 16 according to the present disclosure. The upper part of the protective glove 16 is composed of the fingers 17, the palm, and the back of the hand and at the wrist 18, transitions into the sleeve 19 of the glove. The inside of the protective glove 16 is composed of the textile lining 2. The layer structure of the layered laminate of the two illustrative embodiments will be described in greater detail in conjunction with detail A in FIGS. 5 and 7.

[0054] The method schematically depicted in FIG. 1 for manufacturing the first illustrative embodiment includes the following steps:

[0055] A glove form 1 composed of ceramic is brushed with silicone oil. Then a textile cotton lining 2 is pulled on over the glove form 1. A cloth that is impregnated with a PVA solution is used to apply 3 to 4 coats of the aqueous PVA solution 3 to the textile lining 2. To produce the PVA solution, first 3.75 kg of PVA are dissolved in 25 liters of demineralized water at 90°C. For the ready-to-use solution 3, 1 liter of the parent solution was mixed with 500 ml glycerin and 5 liters of demineralized water. The PVA solution 3 is in particular applied from the finger tips 20 to the wrist 18 by wiping with a cloth, leaving out the sleeve of the glove 19. Then the lining is dried at room temperature. In a heated dipping case 4, the glove form 1 is dipped into a dipping reservoir 5 of a first solution of a synthetic first rubber 6. The solution temperature of the solution of the synthetic first rubber 6 is T = 80°C during the dipping.

[0056] The first solution of a synthetic first rubber 6 contains bromobutyl rubber and toluene as a solvent. No colorants were added to the first bromobutyl solution 6. The first bromobutyl solution 6 has a viscosity of 100 to 200 s (determined with a 6 mm Ford beaker) during the dipping. In a first dip-coating procedure, the glove form 1 is partially dipped into the first bromobutyl solution 6 from the finger tips 19 to the wrist 18 and in the subsequent dip-coating procedures, is dipped into it all the way, i.e. including the sleeve 19. In the first dip-coating procedure, the partial dipping causes a lower hydrostatic pressure to act on the textile lining, in particular on the fingers 17 and the finger tips 20, than would occur in a complete dipping. It is thus possible to reduce the penetration of the textile lining 2 by the first bromobutyl solution 6. After the drying of the first dipped polymer sublayer thus produced, the surface of the textile lining 2 is sealed, thus permitting the dipping in subsequent dip-coating procedures to be carried out with higher hydrostatic pressure at the fingers 17 and the finger tips 20. The dipping is carried out as often and for as long as necessary until the dipped polymer sublayers produced in the individual dipping procedures combine to reach a thickness of approximately 0.1 mm and thus constitute the first polymer sublayer 26 of the first polymer layer 25. For the dipping of the glove form 1 in the bromobutyl solution 6, the lifting device 7 raises and lowers the dipping reservoir 5.
After each dip-coating procedure, the glove form 1 is dried under rotation for a period of 30 minutes at 30°C. [0057] The polymer layer 26 deposited in the first bromobutyl solution 6 and composed of a plurality of polymer dipped sublayers (not shown in detail in FIGS. 6 and 7) is white. The glove form 1 is dried for at least 8 hours at 25 to 30°C in order to remove the solvent.

[0058] Then, in a second heatable dipping casing 8, a dip-coating in a second solution 10 of the synthetic first rubber contained in a dipping reservoir 9 is carried out. The solution temperature of the second rubber solution 10 is 30°C. The second solution of the synthetic first rubber 10 thus likewise contains bromobutyl rubber dissolved in toluene. In addition, the second bromobutyl solution 10 contains carbon as a colorant. The viscosity of the second bromobutyl solution 10 is from 50 to 120 s (determined with a 6 mm Ford beaker). The glove form 1 is dipped into the second bromobutyl solution 10 in three full-immersion dip-coating procedures until the dipped polymer sublayers deposited in this way (not shown in detail in FIGS. 6 and 7) combine to produce the second polymer sublayer 27 of the first polymer layer 25 and have a thickness of approximately 0.05 mm. After each dipping procedure, the glove form 1 is dried under rotation. After the last dip-coating procedure in the second bromobutyl solution 10, the glove form 1 is dried for 12 hours at room temperature.

[0059] Then in a heatable dipping casing 11, the glove form 1 is dipped into a dipping reservoir 12 containing a third rubber solution 13. Here, too, the glove form 1 is not moved, but instead, the lifting device 7 moves the dipping reservoir 12. The third solution of a synthetic third rubber 13 contains a rubber with the monomers 1,1-difluoroethylene, hexafluoropropene, and tetrafluoroethylene, e.g., Viton®. Methyl ethyl ketone is used as a solvent. The temperature T₁ of the Viton® solution 13 is T₁=25°C during the dip-coating procedure.

[0060] After a predefined dipping time, the glove form 1 is removed from the dipping reservoir 12 and dried for 30 minutes at a temperature of 25°C under rotation in the dipping casing 11. The above-described process of dipping in the Viton® solution 13 and the subsequent drying procedure are repeated 3 to 5 times until the layer thickness of the Viton® layer serving as the second polymer layer 27 is approximately 0.1 mm. In order to remove the methyl ethyl ketone completely, the glove form 1 is dried for 12 hours at room temperature. Then, the coated glove form 1 is vulcanized in an autoclave 14 for 120 minutes at a pressure of 3 bar and a temperature of 150°C. Consequently, it is preferable for PVA and/or starch to be used as the polar polymer with hydroxyl groups. Before the first dip-coating procedure, the textile lining 2 in this case is sprayed with the starch-containing solution and is then dried in an oven (30) until the water of the starch-containing solution has completely evaporated, for 20 minutes at 80° Celsius in the example. The subsequent process steps are performed analogously to the first illustrative embodiment.

[0063] FIG. 3 shows a third illustrative embodiment of the manufacturing method. The difference from the first illustrative embodiment (FIG. 1) is in the use of a starch-containing solution 15 in lieu of the PVA solution 3. For example, the starch-containing solution is a conventional ironing or laundry starch solution thinned 1:1 with water. Consequently, it is preferable for PVA and/or starch to be used as the polar polymer with hydroxyl groups. Before the first dip-coating procedure, the textile lining 2 in this case is sprayed with the starch-containing solution and is then dried in an oven (30) until the water of the starch-containing solution has completely evaporated, for 20 minutes at 80° Celsius in the example. The subsequent process steps are performed analogously to the first illustrative embodiment.

[0064] The textile layer 2 or textile lining 2 forms the inside of the glove. The arrow 23 symbolizes the chemical action on the protective glove 16 from the outside.

[0065] In the first illustrative embodiment, in addition to the textile layer 2 and the first polymer layer 25, which is composed of the two polymer sublayers 26 and 27, the layered laminate of the protective glove 16 is also composed of a second polymer layer 28, as schematically depicted in FIG. 6.

[0066] FIG. 2 shows the manufacturing method of a second illustrative embodiment. The second illustrative embodiment has only the first polymer layer 25 and thus constitutes a simplified form of the first illustrative embodiment described above. Here, too, the manufacturing method includes preparing the glove form 1, pulling on the textile lining 2, and coating it with a PVA solution 3. These steps are performed in accordance with the manufacturing method of the first illustrative embodiment. By contrast with the first illustrative embodiment, however, dipping is only carried out in the bromobutyl solutions 6 and 10 according to the manufacturing method of the first illustrative embodiment. After the last dip-coating procedure in the bromobutyl solution 10, the glove form 1 is dried at room temperature to completely remove the methyl ethyl ketone. The coated glove form 1 is then vulcanized in an autoclave 14 for 120 minutes at a pressure of 3 bar and a temperature of 150°C. This bromobutyl layer 25 not only acts as a barrier to liquid media, but also has a very low gas permeability. Consequently, the bromobutyl layer 25 provides protection from gases such as ammonia or hydrogen chloride. The second polymer layer 28 contains a fluorocarbon with the monomers 1,1-difluoroethylene and hexafluoropropene and possibly also tetrafluoroethylene, e.g., Viton®. The Viton® layer 28 has a layer thickness of 0.1 mm. The combination of the bromobutyl layer 25 and the Viton® layer 28 in the layered laminate 29 makes it possible to achieve a protective effect that goes beyond the cumulative action of the two individual layers. The illustrative embodiment has long permeation times for a multitude of compound classes such as halogenated hydrocarbons, acids, bases, and polar organic compounds such as amines and polar solvents. The textile lining 2 simultaneously
ensures a high level of wearing comfort without having a negative impact on tactile sensitivity or flexibility of the protective glove 16.

13. The protective glove according to claim 1, wherein at least one second polymer layer of a second synthetic elastomer is disposed onto the first polymer layer.

14. The protective glove according to claim 13, wherein the second polymer layer contains an elastomer with i) 1,1-difluoroethylene and/or hexafluoropropene monomer units or ii) acrylonitrile monomer units.

15. The protective glove according to claim 1 or 13, wherein the first polymer layer has a thickness of 0.05 mm to 0.5 mm and/or the second polymer layer has a thickness of 0.05 mm to 0.15 mm.

16. The protective glove according to claim 1, wherein the textile layer contains at least residual amounts of a film-forming polymer, in particular polyvinyl alcohol and/or a polysaccharide, preferably starch.

17. A method for manufacturing a protective glove having at least the following steps:

a) placement of a textile lining onto a glove form,
b) application of a solution of a film-forming polymer onto the textile lining and drying of the textile lining,
c) dipping of the glove form into a first solution of a synthetic, first rubber at a temperature T1, where T1 is lower than the cross-linking temperature of the first rubber, in order to produce a first synthetic polymer layer,
d) removal of the glove form from the first rubber solution after a predefined dipping time, with steps c) and d) being carried out once or several times in sequence,
e) drying of the dipped first synthetic polymer layer until the solvent is at least largely evaporated,
f) vulcanization of the first synthetic polymer layer by autoclaving the protective glove,
g) removal of the protective glove from the glove form.

18. The method according to claim 17, wherein the synthetic rubber of the first solution is a butyl rubber, preferably a halogenated butyl rubber, and particularly preferably a bromobutyl rubber.

19. The method according to claim 17, wherein after step e), the glove form is dipped into a second solution of a second synthetic rubber and after a predefined dipping time t2, is removed from the second solution and dried.

20. The method according to claim 19, wherein the second synthetic rubber of the second solution is halogenated.

21. The method according to claim 19, wherein the second synthetic rubber of the second solution contains the monomers 1,1-difluoroethylene and/or hexafluoropropene.

22. The method according to claim 17, wherein the film-forming polymer contained in the film-forming polymer solution is a polar, preferably water-soluble polymer with hydroxyl groups.

23. The method according to claim 17, wherein the solution of the film-forming polymer contains polyvinyl alcohol and/or a polysaccharide, in particular starch.

24. The method according to claim 17, wherein a plasticizer, in particular glycerin, is added to the film-forming polymer solution.

25. The method according to claim 23, wherein the textile lining is brushed with the PVA solution (3) until the amount of application of PVA totals 0.15 to 3 g, preferably 0.3 to 1.8 g, particularly preferably 0.6 to 0.9 g.

26. The method according to claim 17, wherein the viscosity of the first rubber solution is from 100 to 200 s, determined with a 6 mm Ford beaker.
27. The method according to claim 17, wherein the glove form is first dipped into the first solution of the first synthetic rubber and is then dipped into a second solution of the first synthetic rubber and the viscosity of the first solution is greater than the viscosity of the second solution.

28. The method according to claim 17, wherein in at least one of the dip-coating procedures, the glove form is partially pre-dipped to the wrist at least once and then is dipped completely.

29. The method according to claim 17 or 19, wherein the glove form is dipped for as long and as often as necessary into the corresponding rubber solutions until the first polymer layer has reached a thickness of 0.05 to 0.5 mm and/or the second polymer layer has reached a thickness of 0.05 to 0.2 mm.

30. The method according to claim 17, 19, or 27, wherein the protective glove, after the dipping procedures in the first rubber solution or in the various rubber solutions, is vulcanized in step f) at a pressure of 3 to 5 bar and/or a temperature of 60 to 170° C., preferably 90 to 150° C.