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<th>(51) International Patent Classification</th>
<th>(11) International Publication Number:</th>
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<tr>
<td>C08G 18/38, C08K 5/09</td>
<td>WO 90/15834</td>
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<td>C08L 97/02</td>
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<th>(21) International Application Number:</th>
<th>PCT/CA90/00198</th>
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<td>(22) International Filing Date:</td>
<td>20 June 1990 (20.06.90)</td>
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<tr>
<td>(30) Priority data:</td>
<td>P 39 20 218.6 21 June 1989 (21.06.89)</td>
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| (54) Title:                           | BINDER COMPOSITION FOR CHIP LIKE AND/OR FIBROUS MATERIAL |

| (57) Abstract                         | A hardener for use in a binder composition comprises a blocking amount of the metal soap and isocyanate. The metal soap is added to the isocyanate and mixed to form a solution. This solution is contacted with a waterglass to form a binder composition. The binder composition may optionally contain a waterproofing agent such as a paraffin wax emulsion or a dimer alkyl ketene. The binder composition is employed to prepare plywood, particle board, oriented strand board, fibre board, fiberglass and the like. |

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Title: BINDER COMPOSITION FOR CHIP LIKE AND/OR FIBROUS MATERIAL

FIELD OF THE INVENTION

This invention relates to a novel binder composition for chip like and/or fibrous material. More specifically, this invention relates to a binder composition comprising a waterglass, an isocyanate and a metal soap which may be mixed with chip like and/or fibrous materials such as glass, asbestos, wood fibres and cellulose to produce a variety of products including chipboard, plywood, oriented strand board, fibreglass and fibreboard ("fibrous boards").

BACKGROUND TO THE INVENTION

Building materials such as plywood, chipboard and fibreboard are currently produced using aqueous adhesives which are based upon phenol-formaldehyde resins or urea-formaldehyde resins. During the hardening process, volatile compounds present in the adhesive resins are released. This creates two problems. First, part of the adhesive is lost during the hardening process. Secondly, the volatile components of the adhesive such as formaldehyde comprise toxic components and/or carcinogens the release of which is undesirable.
According to the disclosure of United States Patent No. 4,190,459, the combination of waterglass and isocyanate as an adhesive is known. As disclosed in United States Patent No. 4,190,459 at column 1, lines 53-58, "the simultaneous use of isocyanates with waterglass is of no commercial value although the products may be used alongside one another for bonding purposes, because the quality of the bonds obtained is no better than in cases where the two components are used on their own".

United States Patent No. 4,190,459 discloses a process for the production of mineral fibre mats by bonding mineral fibres with a binder comprising an emulsion of waterglass and isocyanate. The emulsion is prepared by mixing the isocyanate and the waterglass in standard mixing units to obtain a stable emulsion. A disadvantage of this emulsion is that the binder has a pot life of a few minutes up to about 30 minutes. Due to the short pot life, it is not economically viable to employ the binder in a commercial process. If a binder having a pot life of about 30 minutes or so is employed in a commercial process, then when there is a breakdown in machinery, the binder would commence to harden and block the passageways in the machinery. This would require much down time, and the possible replacement of parts, prior to bringing the unit back on line. Even without such a
breakdown, the binder would tend to harden due to its short pot life and block the passageways in the machinery.

West German published Patent Application No. 37 18 297 discloses a chipboard which is manufactured by hot-pressing a mixture of wood chips and a binder. The binder comprises waterglass, an alkanedioic dimethyl ester or ethyl ester or a mixture of these esters and a crosslinkable isocyanate resin. This binder composition only has a pot life of about 1 hour.

It is desirable to provide a binder composition which has an extended pot life. It is further desirable to provide a binder composition of waterglass and isocyanate which has a pot life sufficiently long to permit the binder composition to be employed in a commercial process for the manufacture of fibrous boards.

It is further desirable to provide a binder material which does not contain any toxic or cancer causing volatile compounds. It is also desirable to provide a binder composition with which curing can be precisely started and controlled.

**SUMMARY OF THE INVENTION**
A binder composition having an extended pot life may be prepared from a hardener and a waterglass. The hardener comprises a blocking amount of metal soap and isocyanate.

The metal soap preferably is a stearate and is preferably oxyxylated or polyoxyxylated so that it is soluble. The metal and the metal soap may be aluminum, titanium or chrome and more preferably aluminum or titanium.

The isocyanate is preferably a crosslinking isocyanate. The isocyanate may be a di- or poly-isocyanate.

The waterglass is an aqueous solution of an alkali metal silicate. Preferably, the waterglass comprises a sodium or potassium silicate. The waterglass may contain from about 5 to about 50, more preferably from about 30 to about 50 and most preferably about 40 weight percent solids.

The binder composition contains at least about 0.5 weight percent isocyanate based upon the weight of the binder composition. Further, the binder composition may contain from about 1 to about 300 weight percent isocyanate based upon the weight of the waterglass. The
binder composition comprises from about 0.1 to about 50 weight percent metal soap based upon the weight of the isocyanate and, more preferably from about 0.3 to about 10 weight percent metal soap based upon the weight of the isocyanate. The balance of the composition comprises waterglass. Preferably, the binder composition contains from about 1 to about 20 weight percent waterglass based upon the weight of the fibrous or chip like material with which the binder composition is mixed.

The fibrous or chip like material with which the binder composition may be added may be any of those known in the art which are used to prepare chipboard, plywood, oriented strand board, fibre board, fibreglass and the like. The fibrous or chip like material may contain from about 8 to about 12 weight percent water.

The metal soap and the isocyanate are first mixed to produce a solution. The metal soap is preferably added to the isocyanate. These compounds are then thoroughly mixed. Subsequently, the waterglass, and the mixture of isocyanate and metal soap may be mixed to form an emulsion. The emulsion may then be applied as is known in the art to suitable material to prepare plywood or fibreglass. Alternately, in order to prepare particle board, oriented strand board, chipboard or the like, the mixture of isocyanate and metal soap and the waterglass
may each be individually added to the fibrous or chip like material. The mixture of the fibrous or chip like material and the binder composition may be pressed as is known in the art. Preferably, the pressing occurs at from about 180 to about 200°C. Press time varies from about 7 to about 10 seconds per millimetre of pressed board. This is approximately half the press time which is required when utilizing binder compositions which are currently used in the art.

It has now been surprisingly found that by incorporating a metal soap into a binder composition comprising an isocyanate and waterglass that the pot life of the binder composition may be extended for up to eight hours or more. More surprisingly, by using such a composition, it is in fact possible to control the curing of the binder composition so that the hardening reaction does not commence until the binder composition has been applied to the selected fibrous or chip like material and it is desired that the hardening process commence. By utilizing the process of this invention, it is possible to effectively delay the commencement of the hardening reaction until the binder composition has in fact been applied to the fibrous or chip like material and the mixture of fibrous or chip like material and binder composition has reached the stage in processing whereby it is desired to commence the hardening reaction. This
provides the advantage that the hardening reaction can be controlled to occur at the most opportune moment so that the resultant fibrous board has the greatest possible strength.

Further the use of a binder composition according to the present invention avoids the release of cancer causing compounds. Thus, the binder composition is more environmentally friendly and less air treatment is required of the air in a plant.

These and other advantages of the instant invention may be more fully and clearly understood by the following description of the preferred embodiment of the invention.

DESCRIPTION OF THE INVENTION

The binder composition of the instant invention comprises a waterglass, an isocyanate and a metal soap.

The waterglass used in the instant invention may be any waterglass known in the art. In particular, those disclosed in United States Patent No. 4,190,459 and Canadian Patent No. 1,244,181 may be used in the binder composition of the present invention.
The waterglass preferably comprises an aqueous solution of alkali metal silicate. More preferably, the silicate is sodium or potassium silicate and, most preferably, the silicate is sodium silicate.

The water content of the waterglass is selected to provide a binder composition having a viscosity of from about 60 to about 70,000. Such binder compositions are easily workable and may be readily applied to fibrous or chip like material as is known in the art.

The amount of solids present in the waterglass may vary within fairly broad ranges. The amount of solids may be selected in part based upon the desired moisture content of the finished fibrous board. The greater the solid content, the less the amount of water which is incorporated into the final product board. The water content of fibrous boards made from chip like or fibrous material is known to those skilled in the art. These values are designed to avoid the board swelling or shrinking when in use. For example, the moisture content of fibrous boards for use in a house varies from about 8 to about 12 weight percent. Accordingly, in the preparation of plywood or particle board for use in a house, it is desired to have a moisture content in the finished board of from about 8 to about 12 weight percent. If the amount of solids in the waterglass is lowered, then
an increased amount of water will be added to the binder composition and thus to the final product board. If additional water is required to obtain the desired moisture content in the final product, additional water may be added by a separate stream or any other source which is used in industry.

Preferably, the waterglass contains from about 5 to about 50 weight percent solids in water. More preferably, the waterglass contains from about 30 to about 50 weight percent solids in water and, most preferably, the waterglass contains about 40 weight percent solids in water.

The amount of waterglass which may be employed in the binder composition of the present invention varies between fairly broad ranges. The amount of waterglass employed may vary from about 1 weight percent to about 20 weight percent, based upon the weight of fibrous or chip like material to be bonded. More preferably, with respect to the production of chipboards, from about 0.5 to about 10 weight percent waterglass based upon the weight of the wood particles may be employed. With respect to plywood, from about 1 to about 40 weight percent waterglass, based on the weight of the binder composition and, more preferably, about 10 weight percent waterglass may be employed. With respect to oriented strand board, from
about 0.3 to about 20 weight percent and, more preferably from about 0.3 to about 4 weight percent waterglass, based upon the weight of the wood particles may be employed. For the production of fibreglass, about 10 weight percent waterglass, based upon the weight of fibreglass may be used. With respect to the production of medium density fibreboard, from about 1 to about 25 weight percent waterglass and, more preferably, from about 1 to about 10 weight percent waterglass, based upon the weight of fibreglass may be employed.

The isocyanates which may be employed in a binder composition of waterglass and isocyanates are known to those skilled in the art. Suitable isocyanates are disclosed in United States Patent No. 4,190,459. The isocyanate which is employed is preferably a crosslinking isocyanate. Preferably, the isocyanate is a di-isocyanate; however, polyisocyanates may also be employed.

Examples of isocyanates which may be employed include methyl-4,4′-diisocyanate and diphenyl methyl-4,4′-diisocyanate.

The amount of isocyanate which may be employed in the process of the present invention may vary between fairly broad ranges. Generally, a sufficient amount of isocyanate to react with the waterglass must be provided
so that suitable bonding characteristics are obtained. Generally, at least about 0.5 weight percent isocyanate, based upon the total weight of the binder compositions is employed to ensure that the hardened binder composition has sufficient strength. In general, by increasing the amount of isocyanate present in the binder composition, the adhesive strength of the bonding composition and the water stability of the bonded product are increased. However, as the isocyanate is relatively expensive, an increase in the amount of isocyanate results in an increase in the cost of the final binder composition. The specific amount of isocyanate which must be employed will thus vary depending upon such factors as the degree of water resistance in the desired product, the adhesive strength which is required and the target cost of the bonded material. These factors will vary depending whether it is desirable to produce chipboard, oriented strand board, medium density fibreboard, plywood, fibreglass or some other related material.

Preferably, from about 1 to about 300 weight percent, more preferably from about 150 to about 250 weight percent and, most preferably from about 180 to about 220 weight percent isocyanate, based upon the weight of waterglass, is employed. If the binder composition is to be employed in the production of chipboard, oriented strand board or medium density fibreboard, from about 100
to about 300 weight percent, more preferably from about 150 to about 250 weight percent and most preferably from about 180 to about 220 weight percent isocyanate based upon the weight of the waterglass may be employed. In the case of the production of the plywood or fibreglass, from about 45 to about 75, weight percent isocyanate based upon the weight of the waterglass may be used.

The third ingredient used in the binder composition of the present invention is a metal soap. Preferably, the metal soap is solubilized so that it may be readily mixed with the isocyanate. Accordingly, the metal soap may be oxylated or polyoxylated as described hereinafter. Metal soaps which are oxylated or polyoxylated are not in a powder or water based paste.

Preferably, the metal soap is dissolved in an alcohol or an aromatic solvent. More preferably, the metal soap is dissolved in a higher aromatic compound. Most preferably, the metal soap is dissolved in xylene, toluene or white spirit.

The metal in the metal soap may be any of those known in the art. Preferably, the metal is aluminium, titanium or chrome and, most preferably, the metal is aluminium or titanium.
The fatty acid used in the production of the metal soap may be saturated or unsaturated. Preferably, the fatty acid used in the production of the metal soap may contain about 18 carbon atoms. Most preferably, the metal soap is a stearate. Quite surprisingly, the results obtained using stearates are greatly improved over those obtained using metal soaps made from fatty acids having greater than or less than 18 carbon atoms.

The amount of the metal soap which is employed varies between fairly broad ranges. If the amount of metal soap used is too little, then the reaction will commence more or less immediately upon contacting the waterglass with the isocyanate. In general, the greater the amount of metal soap which is used, the more pronounced is the effectiveness of the stearate in delaying the reaction between the isocyanate and the waterglass. Further, the use of greater amounts of the metal soap alleviate the problem of the fibrous board sticking to the press, a problem which is known to the industry. For example, if greater than about 10 weight percent stearate is used, based upon the weight of the isocyanate, then the resultant board does not stick to the press. Without meaning to be limited to any extent by theory, it is believed that when the metal soap is mixed with the isocyanate, the metal soap acts as a blocking agent isolating the isocyanate from the waterglass thus
delaying the reaction between the waterglass and the isocyanate. Accordingly, the longer the pot life which is required, the greater the amount of metal soap which must be employed. Accordingly, it is preferred to employ a blocking amount of metal soap; namely, a sufficient amount to delay the hardening reaction between the isocyanate and the waterglass for a preselected time. Preferably, from about 0.1 to about 50 weight percent metal soap, based upon the weight of the isocyanate may be used and, more preferably, from about 0.3 to about 10 weight percent.

According to the process of the instant invention, the isocyanate is contacted with the metal soap prior to contacting the isocyanate with the waterglass. The mixture of the metal soap and the isocyanate may be stored for up to 8 hours or more prior to their use. The isocyanate and the metal soap may be added in any order to a suitable mixing vessel. Preferably, the metal soap is added to the isocyanate. The two compounds are then mixed to form a solution of isocyanate and metal soap. This solution comprises the hardener for the binder composition. Preferably, the mixing occurs rapidly and with high energy input such as is obtained with a dissolver mixer or a blender operating at about 500 to 800 rpm. The mixing may be conducted at room temperature.
The binder composition and the fibrous or chip like material may be contacted and processed into a fibrous board according to means known in the art. The binder composition may be mixed with the fibrous or chip like material as is known in the art. Any standard additives known in the art may also be added. The mixture of binder composition and chip like or fibrous material may then be placed in a mold and pressed.

In particular, as will be explained in more detail hereinafter, the subsequent processing steps will vary depending upon the product which is to be obtained. The waterglass, isocyanate and metal soap may be mixed and sprayed on to the fibrous or chip like material. Alternately, the waterglass and the mixture of the isocyanate and the metal soap may each be separately sprayed onto the fibrous or chip like material which are in a mixer. By way of example, if plywood or fibreglass is to be prepared, the waterglass and the mixture of isocyanate and metal soap may be blended to form an emulsion. The fibrous or chip like material is coated with this emulsion and the coated material is subsequently processed to obtain the desired product. Alternately, if it is desired to prepare particle board, chipboard or oriented strand board, the mixture of isocyanate and metal soap may be sprayed onto the fibrous or chip like material from one nozzle and the waterglass (possibly blended with
additional water and or a parafin wax as described hereinafter) may be sprayed onto the fibrous or chip like material from a second nozzle. The material is then processed as is known in the art.

The binder composition of the present invention may be used as a binder for known fibrous or chip like material including glass, asbestos, wood and cellulose chips and fibres and related chip and fibrous material. Accordingly, the binder composition is suitable for use in the preparation of numerous building materials such as particle board, plywood, oriented strand board, chipboard, fibreglass, fibreboards including medium density fibreboards and other related materials.

Typically, in the production of particle board and the like, standard production methods known in the art require that the particles be dried to about 3% humidity. If the wood fibres contain a higher percent water, then the resultant board will split. By employing the binding composition of the present invention, it is possible to prepare particle board and the like wherein the particles, before addition of the binder composition, have a water content of up to about 12 weight percent water. The ability to use fibrous or chip like material having increased amounts of water present therein provides various advantages. First of all, as particles having an
increased amount of water may be used, less energy is required in obtaining particles having the required degree of dryness. This decreases the energy which must be input to obtain the drier particles. Further, this results in a relatively substantial cost savings and increases the flexibility of the process since a greater range of starting material may be employed.

As is apparent from the forgoing, the mixture of the isocyanate and the metal soap, namely the hardener, may be mixed with the waterglass in any order or separately applied to the chip like or fibrous material. Once mixed to form the binder composition, the binder composition has a pot life of about 8 hours or more at room temperature, particularly if the metal soap is a stearate. This provides sufficient time for utilizing the binder composition in a commercial manufacturing process.

The curing of the binder composition to form a hard silicate adhesive commences fairly rapidly upon the addition of heat. Accordingly, the binder composition and the fibrous or chip like material may be mixed and placed in a mold at room temperature. Pursuant to these processing steps, substantially no curing of the binder composition occurs. Once the mixture of the binder composition and the fibrous or chip like material is in the mold and ready to be pressed, heat may be applied. In
this manner, the commencement of the curing of the binder composition may be precisely controlled to commence at the most opportune time in the process. As the curing reaction is exothermic, part of the heat needed to complete reaction is provided by the curing reaction itself.

The curing reaction is relatively rapid. In the industry, pressing is normally conducted from about 180 to about 200°C. These temperatures may be used in preparing boards incorporating the binder composition of the present invention. This simplifies replacing the binder composition presently used in the industry with the binder composition of the present invention. In comparison with boards bonded by phenol resins which are currently used by industry, when using the binder composition of the present invention, the press time is approximately half of that required when using phenol resins. For example, phenol formaldehyde resins require a press time of between about 14 to about 16 seconds for each one millimetre of board thickness. In comparison, the binder composition of the present invention requires only from about 7 to about 10 second of press time for each millimetre of board thickness.

The binder composition of the present invention may be used to replace the binder composition presently
used in the industry. Accordingly, the binder composition of the present invention may be readily adopted by industry. Further, due to the decreased pressing time, the amount of product produced by an existing plant may be substantially increased, thus reducing the cost of the fibrous board. Further, as the binder composition of the present invention does not result in the release of toxic compounds during the pressing of the boards, the binder composition of the present invention is more environmentally friendly and results in further cost savings in the production of boards. Further, boards prepared using the binder composition of the present invention may be treated in the same manner as boards processed from phenol resins and similar materials. Accordingly, the boards made by the binder composition of the present invention may be laminated like known boards.

The binder composition of the present invention may optionally include additives which are currently used in the production of chipboard, oriented strand board, plywood, fibreglass, fibreboard and related materials. As is known in the art, the resultant board may be waterproofed by the addition of a paraffin wax emulsion, preferably having 50 to 60 percent solids, or a dimer alkyl ketene to the binder composition. The emulsion or ketene is preferably added to the mixture of the isocyanate and the waterglass. According to normal
production methods using conventional binder compositions, from about 0.6 to about 2.4 percent of this wax emulsion is added to the binder composition based upon the dry wood weight. This results in an increase in the two hour swell of wood as measured by British Standard. When used with the binder composition of the present invention, the 2 - 24 hour water swell is improved by using only about 0.6 percent of the emulsion.

The invention will be further understood by the following examples which are not to be construed as a limitation on the invention. Those skilled in the art will appreciate that other and further embodiments are obvious and within the spirit and scope of this invention from the teachings of the present examples taken with the accompanying specification.

Example 1 - Preparation of Particle Board

1 gram oxylated aluminum stearate were added to 50 grams of diphenylmethyl-4,4'-diisocyanate ("MDI"). These compounds were mixed to form 51 grams of a hardener for the binder composition. This hardener and 25 grams of an aqueous solution of sodium silicate (40 percent solids) were sprayed from separate nozzles onto 1,000 grams of particles abs.dry. The particles, silicate and hardener were mixed and placed in a mold 16 mm thick. The
composition was pressed at 200°C for 160 seconds. The resultant particle board could be cut, used for screws and otherwise handled as a particle board made from a phenol resin from the same particles.

Example 2 - Production of Particle Board

The method of Example 1 was repeated except prior to spraying the silicate on the particles, 10 grams of dimer alkyl ketene 60% were mixed with the sodium silicate. The mixture of the sodium silicate and ketene and the mixture of the isocyanate and stearate were each separately sprayed onto 1,000 grams of wood particles abs dry. The resultant particle board could also be cut, used for screws and otherwise handled as a particle board prepared from a phenol resin made from the same particles.

The particle board had a swelling property of 2.22 percent as measured by British Standard with a water absorption of 11.4 percent. After 24 hours, the swelling was 8.1 percent with a water absorption of 27.5 percent.

Example 3 - Water Resistant Plywood of Marine Quality

A binder composition was prepared from the following constituents:
100 grams water
5 grams carboxyl methyl cellulose 4,000
1,000 grams silicate of sodium, 50° baume
100 grams dimer alkyl ketene
5 500 grams MDI
5 grams al stearate

The compounds were mixed in the following order. The stearate and the isocyanate were placed in a mixer and mixed. This mixture was then set aside. The water and cellulose was added to a mixer and mixed for 5 minutes. The silicate and ketene were added and mixing continued for 5 minutes. The MDI/stearate mixture was added and mixing continued for 5 minutes.

The constituents were mixed in a dissolver mixer at 1,500 to 2,000 rpm to prepare the final emulsion. The emulsion was pumped to spreading (distributing) machines. Cut wood plies were covered with this emulsion, sandwiched with crossing direction fibres and pre-pressed at room temperature for 10 minutes. Subsequently, the plywood was processed in a hot press (180 °C) for 2 minutes and 40 seconds to obtain 16 mm plywood.

Example 4 - Chipboard
A hardener composition was prepared by adding 1 gram of al stearate to 50 grams of MDI and mixing for 5 minutes in a dissolver mixer at 1,500 rpm. Twenty-five grams of sodium silicate (40 percent solids) and 10 grams of dimer alkyl ketene were mixed to form a second solution.

One thousand grams of planing chips were placed in a compulsory mixer. Two spray nozzles were focused on the chips. Mixing was commenced and the chips were sprayed with the hardener composition from one nozzle and the silicate mixture from a second nozzle. The mixing continued for 5 minutes. Subsequently, the mixture was placed in a press and pressed at 200°C for 2 minutes and 40 seconds to form chipboard 16 mm thick.

Example 5

An emulsion was prepared according to the process of Example 3 from 1,000 grams water, 1,000 grams sodium silicate 50° baume, 200 grams MDI and 10 grams al stearate. The resultant mixture was sprayed onto 33 kg of wood fibres and pressed at 200°C for 2 minutes and 40 seconds to obtain board 16 mm thick.

Example 6 - Preparation of Construction Grade 3/8" Plywood

Having 14 Percent Wood Moisture Content
A hardener composition was prepared as follows. One hundred kg of isocyanate was added to an 80 horsepower dissolver/mixer. The dissolver mixer was started and 50 kg of aluminum stearate in white spirit was added. Mixing continued for 5 minutes. This mixture was set aside.

Six hundred and seventy kg of water were placed in an 80 horsepower dissolver/mixer. The mixer was operated at 1500 rpm. One kg of tylose (10,000 yp) was added to the mixer. Mixing continued for 2 minutes. Subsequently, one kg of 30 percent ammonia solution was added to the mixer and mixing continued for one minute. One hundred and thirty kg of waterglass (36 percent solids) were added. Subsequent to the addition of waterglass, 40 kg of wheat flour were added slowly in a number of parts. Mixing continued for approximately 2 minutes until the lumps disappeared. Thirty kg of COCOB were slowly added while mixing continued. Mixing continued until the lumps disappeared. At this time, 60 kg of the isocyanate/stearate mixture, which had been previously prepared, was added to the mixer. Mixing continued for 5 minutes until a medium viscosity was obtained.
The resulting emulsion was applied by mechanical rollers onto plywood veneers at a rate of about 200 grams of binder composition per square metre of plywood. The plywood was placed in a press and pressed at a rate of 10 seconds per millimetre of pressed wood at 200°C.

A similar process could be used to prepare fibreglass insulation.

Example 7

The hardener composition was prepared as set out in Example 6. A waterglass mixture was prepared by placing 135 kg of water, 100 kg of paraffin mobilcer (60 percent solids) and 50 kg of sodium silicate (50 percent solids) in a dissolver/mixer and mixing at 1,500 rpm for 5 minutes.

One thousand kg of wood wafers (9 percent moisture content) were placed in a blender/mixer. The mixer was started and the wood was sprayed with 28.5 kg waterglass mixture from one nozzle and 10 kg of the hardener from a second nozzle.

The mixture of wood chips and binder composition was placed in a press and pressed at 200°C for 10 seconds.
of press time per millimetre of board thickness at 35 bars of pressure. A similar process can be used to prepare wafer boards and chipboards.
THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A hardener for use in a binder composition comprising a blocking amount of a metal soap and an isocyanate.

2. The hardener as claimed in claim 1 wherein the isocyanate is a crosslinking isocyanate.

3. The hardener as claimed in claim 1 wherein said isocyanate is a diisocyanate or a polyisocyanate.

4. The hardener as claimed in claim 1 wherein said isocyanate is methyl-4,4'-diisocyanate or diphenyl methyl-4,4'-diisocyanate.

5. The hardener of claim 1 wherein said metal soap is oxylated or polyoxylated.

6. The hardener as claimed in claim 1 wherein the metal of said metal soap is aluminum, titanium or chrome.

7. The hardener as claimed in claim 1 wherein the metal of said metal soap is titanium or aluminum.

8. The hardener as claimed in claim 1 wherein the hardener comprises from about 0.1 to about 50 weight
percent metal soap, based upon the weight of the isocyanate.

9. The hardener as claimed in claim 1 wherein the hardener comprises from about 0.1 to about 10 weight percent metal soap, based upon the weight of the isocyanate.

10. The hardener as claimed in claim 1, 2, 3, 4, 5, 6, 7, 8 or 9 wherein said metal soap is a metal stearate.

11. In a process for the preparation of a binder composition comprising waterglass and isocyanate for fibrous or chip like material, the step of mixing a blocking amount of a metal soap with the isocyanate.

12. The process as claimed in claim 11 wherein the metal soap is added to the isocyanate prior to the mixing of the metal soap and the isocyanate.

13. The process as claimed in claim 12 wherein the mixture of isocyanate and metal soap is contacted with waterglass.

14. The process as claimed in claim 13 wherein the mixture of the isocyanate and metal soap is mixed with the waterglass to form an emulsion.
15. The process as claimed in claim 12 wherein said mixture of isocyanate and metal soap and said waterglass are each separately contacted with to said fibrous or chip like material.

16. The process as claimed in claim 14 or 15 wherein said isocyanate is a crosslinking isocyanate.

17. The process as claimed in claim 14 or 15 wherein said isocyanate is a diisocyanate or a polyisocyanate.

18. The process as claimed in claim 14 or 15 wherein said metal soap is oxylated or polyoxylated.

19. The process as claimed in claim 14 or 15 wherein the metal of said metal soap is aluminum, titanium or chrome.

20. The process as claimed in claim 14 or 15 wherein said mixture of metal soap and isocyanate comprises from about 0.1 to about 50 weight percent metal soap based upon the weight of the isocyanate.

21. The process as claimed in claim 14 or 15 wherein said mixture of metal soap and isocyanate comprises from
about 0.3 to about 10 weight percent metal soap based upon the weight of the isocyanate.

22. The process as claimed in claim 14 or 15 wherein said binder composition comprises from about 1 to about 20 weight percent waterglass based upon the weight of said fibrous or chip like material.

23. The process as claimed in claim 11, 12, 13, 14 or 15 wherein said metal soap is a metal stearate.

24. A binder composition comprising at least about 0.5 weight percent isocyanate based upon the weight of the binder composition, a blocking amount of metal soap, the balance of said binder composition comprising waterglass.

25. The composition as claimed in claim 24 wherein said isocyanate is a crosslinking isocyanate.

26. The binder composition of claim 25 wherein said isocyanate is a diisocyanate or a polyisocyanate.

27. The binder composition of claim 26 wherein said metal soap is oxyalted or polyoxylated.

28. The binder composition of claim 27 wherein the metal of said metal soap is aluminum, titanium or chrome.
29. The binder composition of claim 28 wherein said binder composition comprises from about 1 to about 50 weight percent metal soap based upon the weight of said isocyanate.

30. The binder composition of claim 29 wherein said binder composition comprises from about 0.3 to 10 weight percent metal soap based upon the weight of said isocyanate.

31. The binder composition of claim 30 wherein said binder composition contains from about 1 to about 300 weight percent isocyanate based upon the weight of said waterglass.

32. The binder composition as claimed in claim 31 wherein said waterglass is an aqueous solution of alkali metal silicate.

33. The binder composition of claim 32 wherein said silicate is sodium or potassium silicate.

34. The binder composition of claim 32 wherein the waterglass contains from about 5 to about 50 weight percent solids.
35. The binder composition of claim 32 wherein the waterglass contains from about 30 to about 50 weight percent solids.

36. The binder composition of claim 32 wherein the waterglass contains about 40 weight percent solids.

37. The binder composition of claim 24 wherein said binder composition further comprises one or more of additional water, a paraffin wax emulsion or a dimer alkyl ketene.

38. The binder composition of claim 24, 27, 28, 29, 30, 31, 32, 33 or 34 wherein said metal soap is a metal stearate.

39. A fibrous board comprising:

(a) a binder composition comprising, prior to curing, at least about 0.5 weight percent isocyanate based upon the weight of the binder composition, a blocking amount of metal soap, the balance of said binder composition comprising waterglass; and,

(b) a fibrous or chip like board forming material.
40. The fibrous board of claim 39 wherein said metal soap is a metal stearate.

41. The fibrous board of claim 40 wherein said stearate is oxylated or polyoxylated.

42. The fibrous board of claim 41 wherein said binder composition comprises from about 0.1 to about 50 weight percent metal stearate based upon the weight of said isocyanate.

43. The fibrous board of claim 42 wherein said isocyanate is a crosslinking isocyanate.

44. The fibrous board of claim 43 wherein said binder composition comprises from about 1 to about 300 weight percent isocyanate based upon the weight of said waterglass.

45. The binder composition of claim 44 wherein said waterglass is an aqueous solution of an alkali metal silicate.

46. The fibrous board of claim 45 wherein said waterglass contains from about 5 to about 50 weight percent solids.
47. The fibrous board of claim 46 wherein said fibrous board contains from about 1 to about 20 weight percent of waterglass based upon the weight of said fibrous or chip-like material.

48. The fibrous board of claim 47 wherein said binder composition further comprises, prior to curing, one or more of additional water, a paraffin wax emulsion or a dimer alkyl ketene.

49. The fibrous board of claim 48 wherein said fibrous or chiplike board forming material contains from about 8 to about 12 weight percent water.
# INTERNATIONAL SEARCH REPORT

International Application No: PCT/CA 90/00198

## I. CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or to both National Classification and IPC

**IPC**
- C 08 G 18/38, C 08 K 5/09, C 08 L 97/02

## II. FIELDS SEARCHED

Minimum Documentation Searched

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Documentation Searched other than Minimum Documentation to the extent that such documents are included in the fields searched.

## III. DOCUMENTS CONSIDERED TO BE RELEVANT

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<th>Citation of Document, with indication, where appropriate, of the relevant passages</th>
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<td>DE, A, 3718297 (BAUCHEMIE) 15 December 1988, see claims 1-11; column 2, line 44 - column 3, line 47 cited in the application</td>
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<td>Y</td>
<td>WO, A, 8601215 (DOW CHEMICAL) 27 February 1986 see page 12, line 27 - page 14, line 3; claim 1</td>
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  - "A" document defining the general state of the art which is not considered to be of particular relevance
  - "E" earlier document but published on or after the international filing date
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  - "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
  - "A" document member of the same patent family

## IV. CERTIFICATION

Date of the Actual Completion of the International Search: 5th September 1990

Date of Mailing of this International Search Report: 22 OCT 1990

International Searching Authority: EUROPEAN PATENT OFFICE

Signature of Authorized Officer: MISS D. S. KOWALCZYK

Form PCT/ISA/210 (second sheet) (January 1985)
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