(19) **United States**
(12) **Patent Application Publication**
GEORGE et al.

(10) **Pub. No.: US 2015/0251396 A1**
(43) **Pub. Date: Sep. 10, 2015**

(54) **METHOD AND APPARATUS FOR TEMPORARY BONDING OF ULTRA THIN WAFERS**

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(21) Appl. No.: **14/714,587**

(22) Filed: **May 18, 2015**

Related U.S. Application Data

(62) Division of application No. 13/790,684, filed on Mar. 8, 2013, now Pat. No. 9,064,686.

Publication Classification

(51) **Int. Cl.**

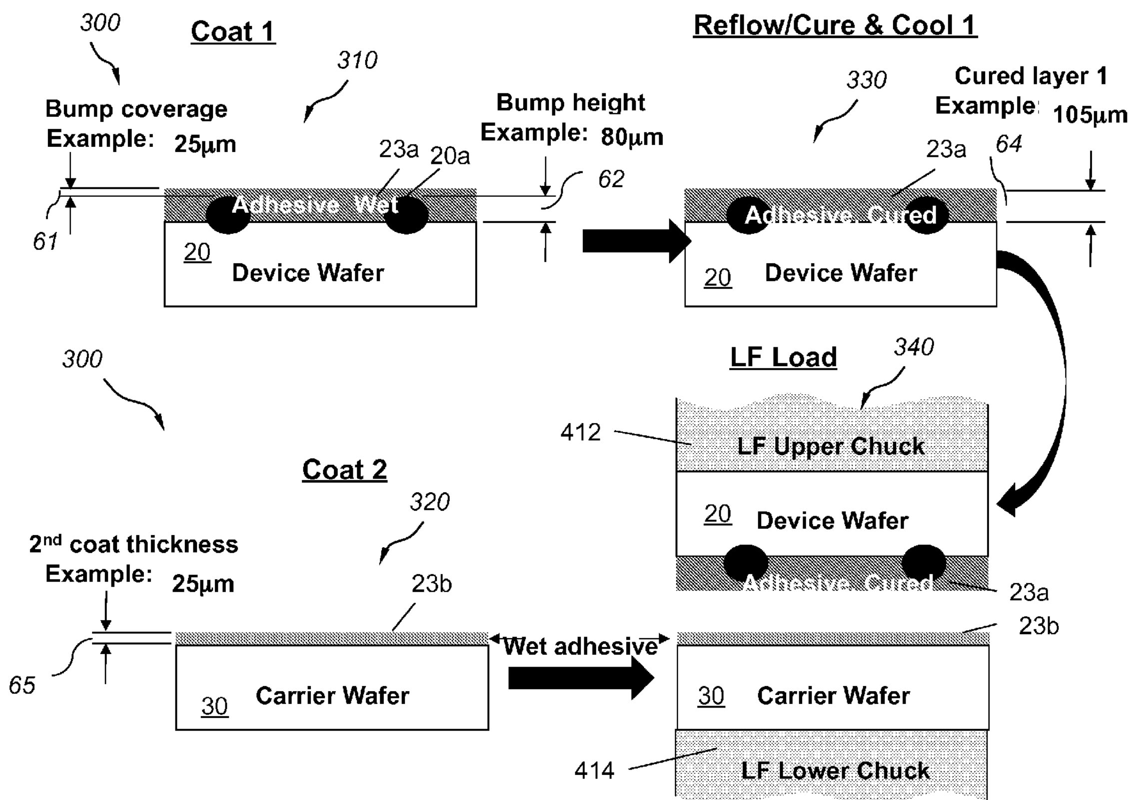
B32B 37/00 (2006.01)
B32B 37/18 (2006.01)
H01L 21/683 (2006.01)
B32B 37/12 (2006.01)

(52) **U.S. Cl.**

CPC ***B32B 37/0046*** (2013.01); ***B32B 37/1284*** (2013.01); ***B32B 37/18*** (2013.01); ***H01L 21/6835*** (2013.01); *B32B 2307/202* (2013.01); *B32B 2457/14* (2013.01)

(57) **ABSTRACT**

An apparatus for temporary bonding first and second wafers includes, a first coating chamber configured to apply a first adhesive layer upon a first surface of a first wafer; a second coating chamber configured to apply a second adhesive layer upon a first surface of a second wafer; a curing chamber configured to cure the first adhesive layer of the first wafer; a bonder module comprising an upper chuck assembly and a lower chuck assembly arranged below and opposite the upper chuck assembly. The upper chuck assembly is configured to hold the first wafer so that its first surface with the cured first adhesive layer faces down. The lower chuck assembly is configured to hold the second wafer so that the second adhesive layer faces up and is opposite to the cured first adhesive layer. The lower chuck assembly is configured to move upwards and thereby to bring the second adhesive layer in contact with the cured first adhesive layer. The curing chamber is further configured to cure the second adhesive layer after it is brought in contact with the cured first adhesive layer, thereby forming a temporary bond between the first and second wafers.



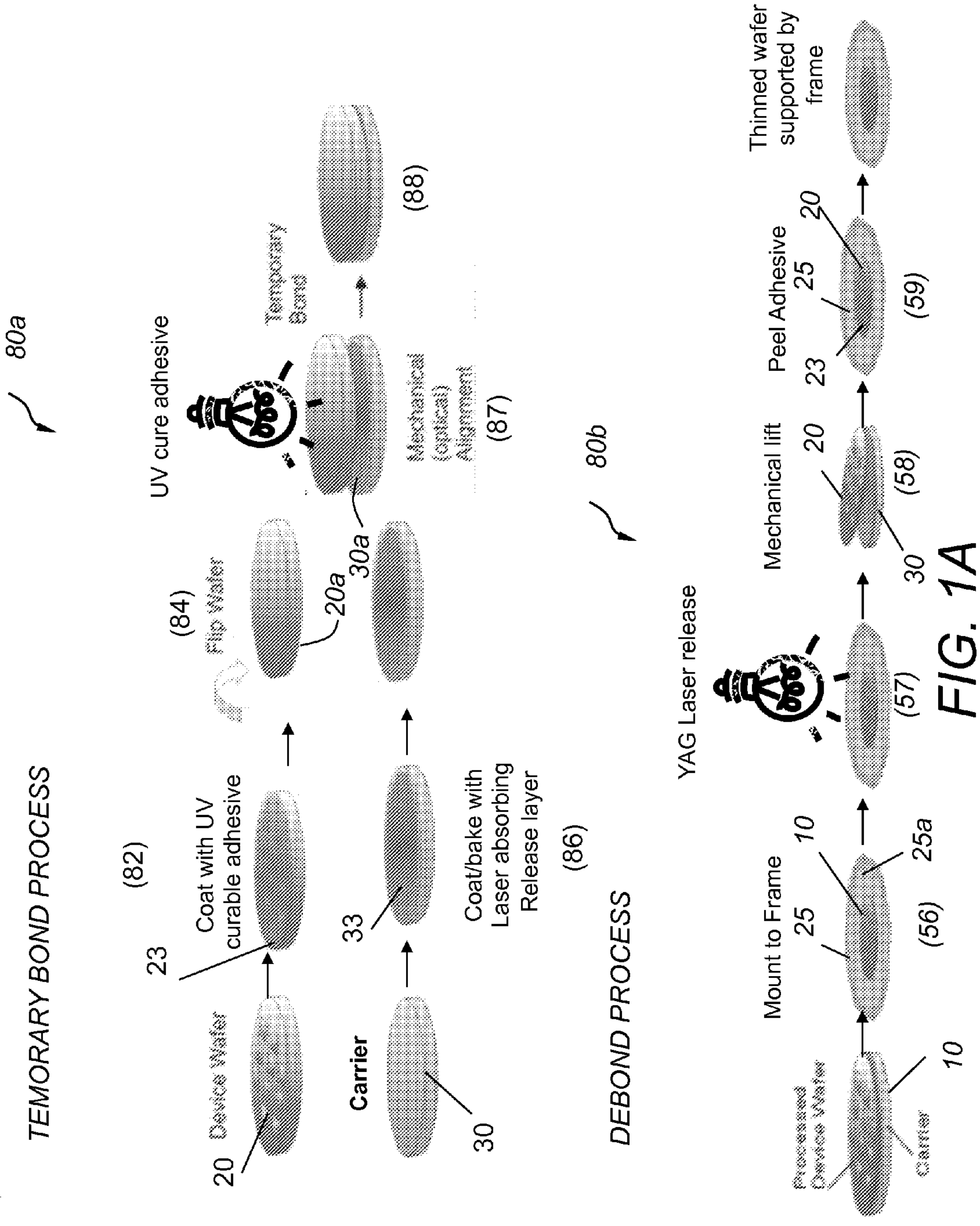


FIG. 1A

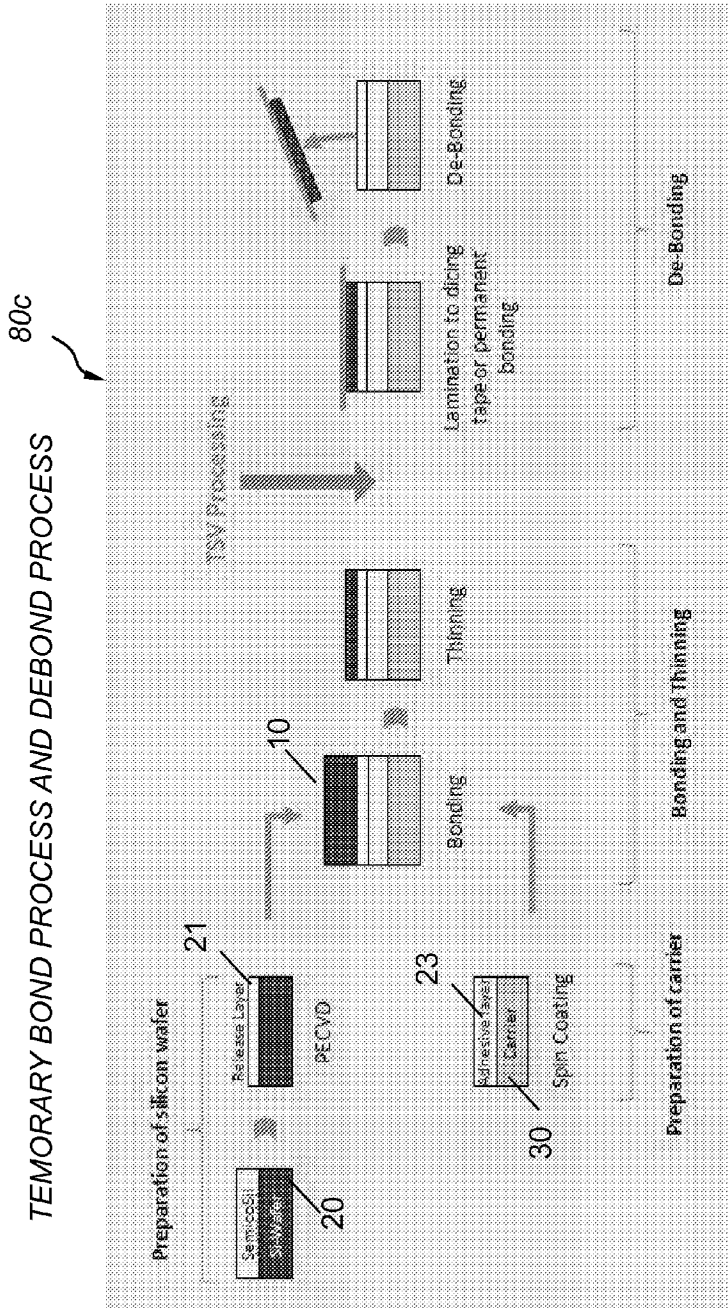
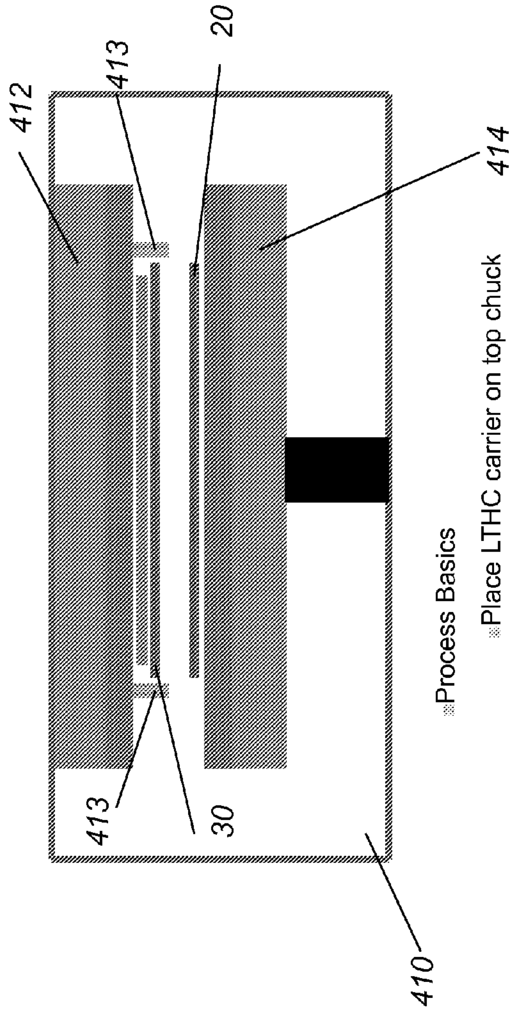


FIG. 1B



- Process Basics
  - Place LTHC carrier on top chuck
  - Apply holding pins
  - Place adhesive wafer on bottom chuck
  - Robot align
  - Vacuum pump down
  - Top chuck moves down, sliding on holding pins
  - Apply force
  - Unload stack
  - UV cure adhesive

FIG. 2

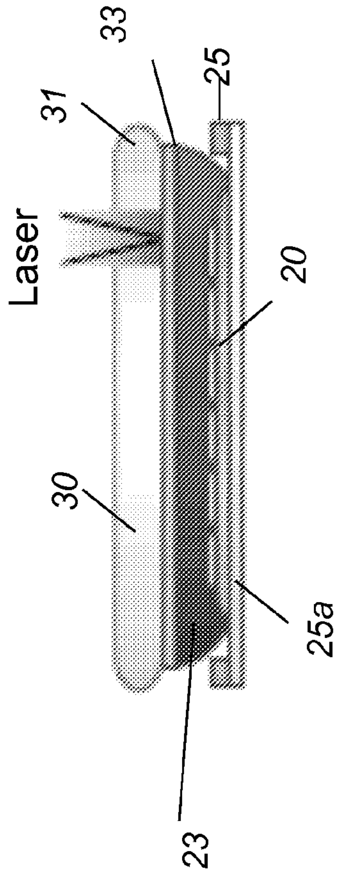


FIG. 3

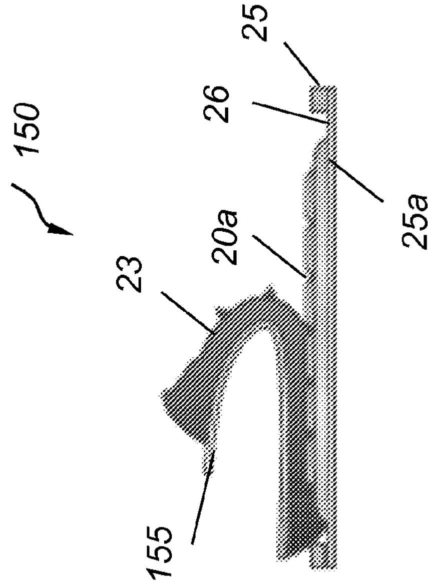


FIG. 5

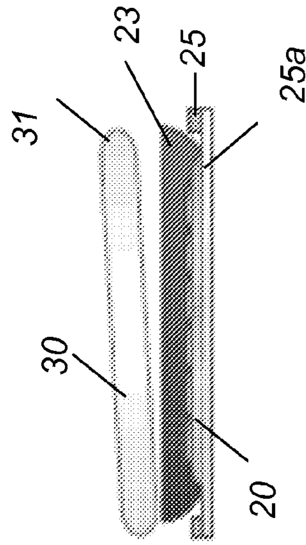


FIG. 4

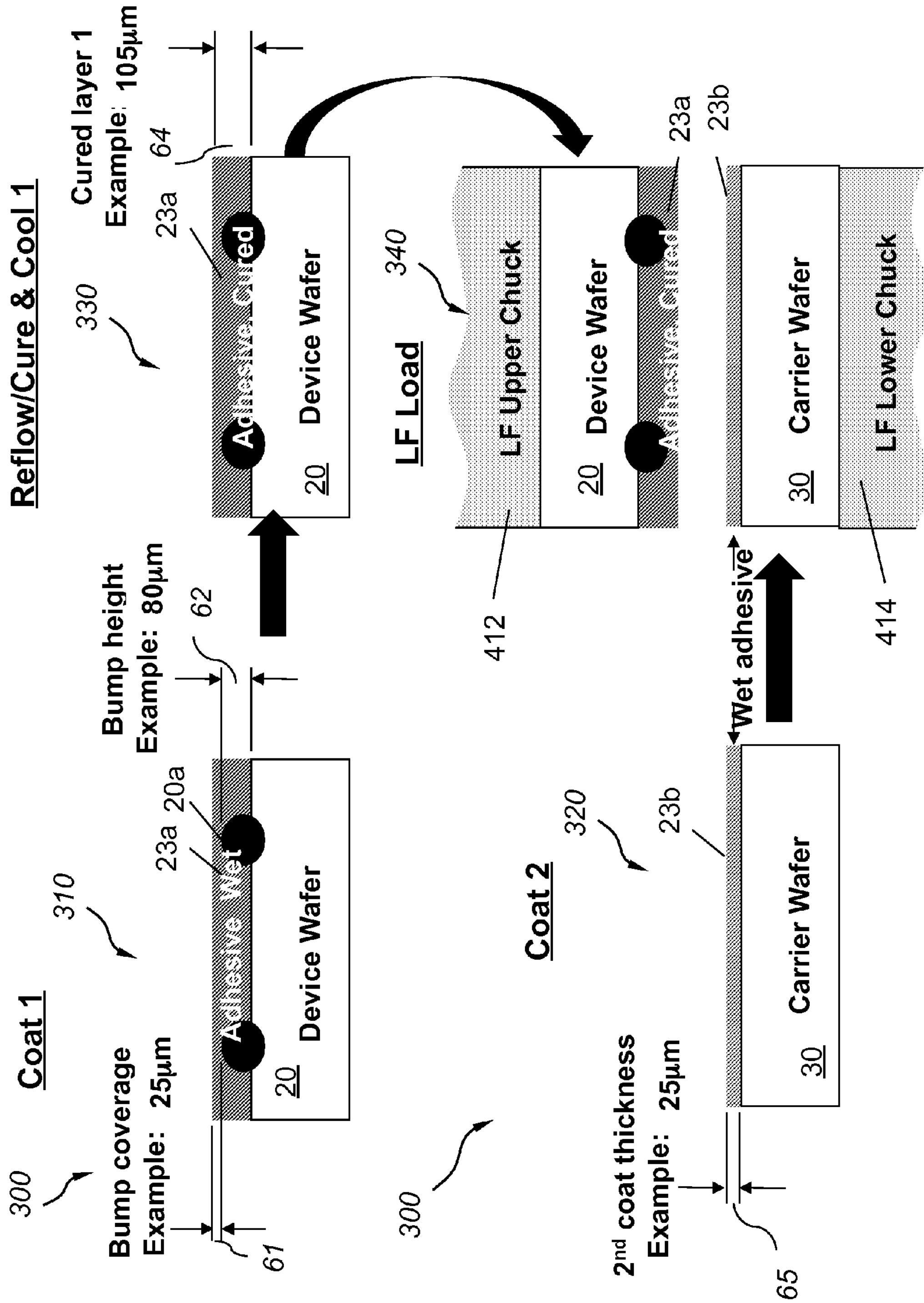


FIG. 6A

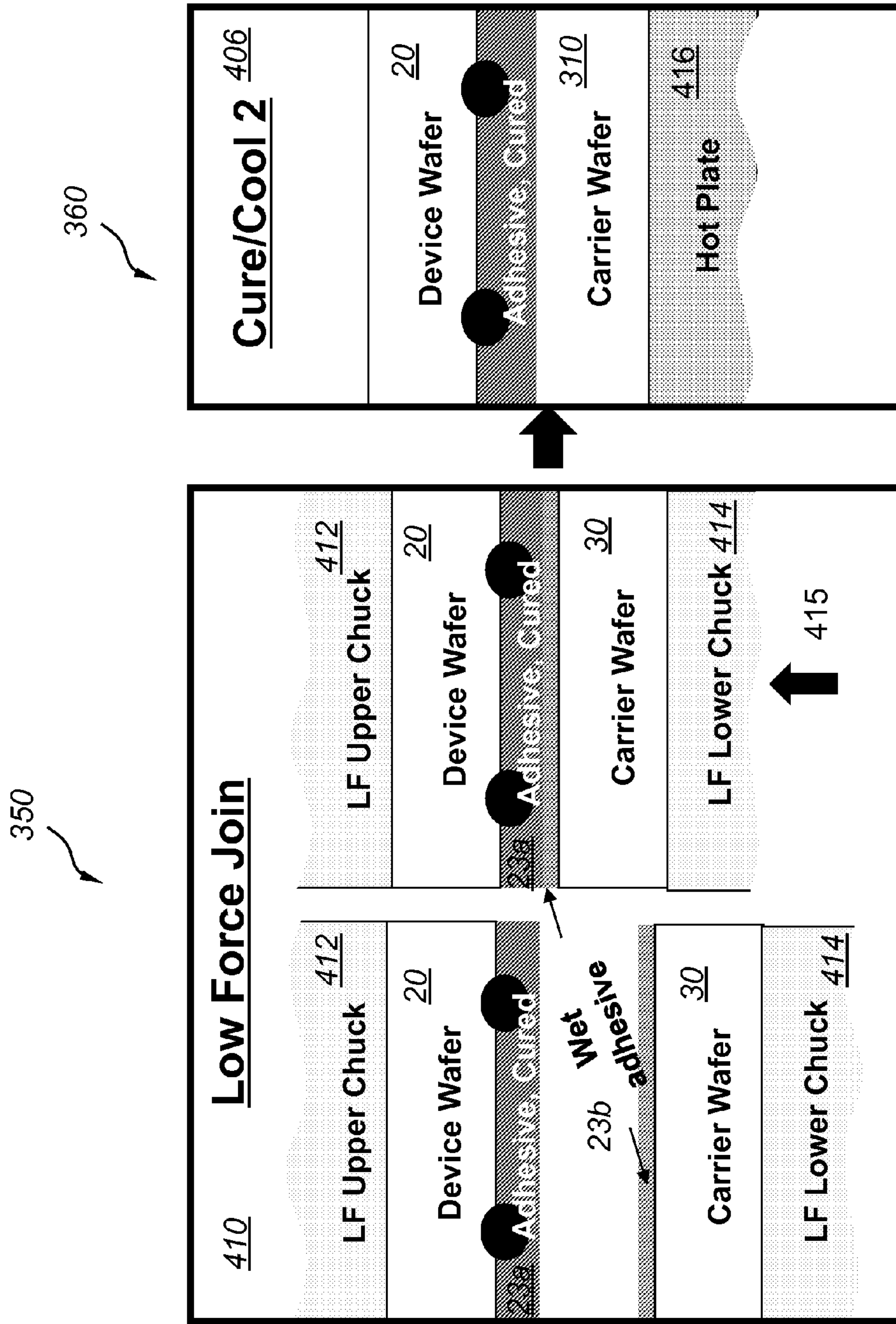


FIG. 6B

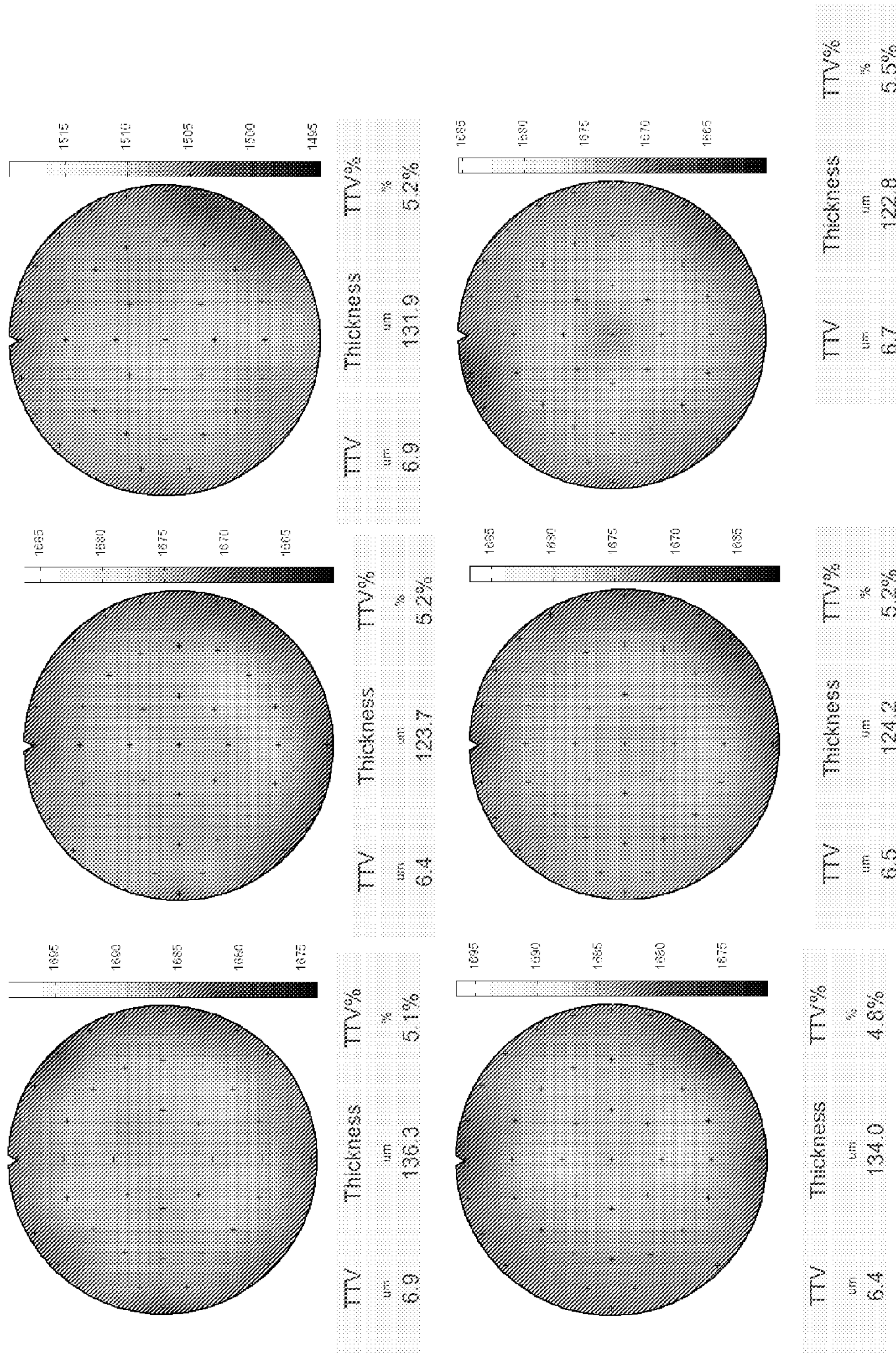


FIG. 7

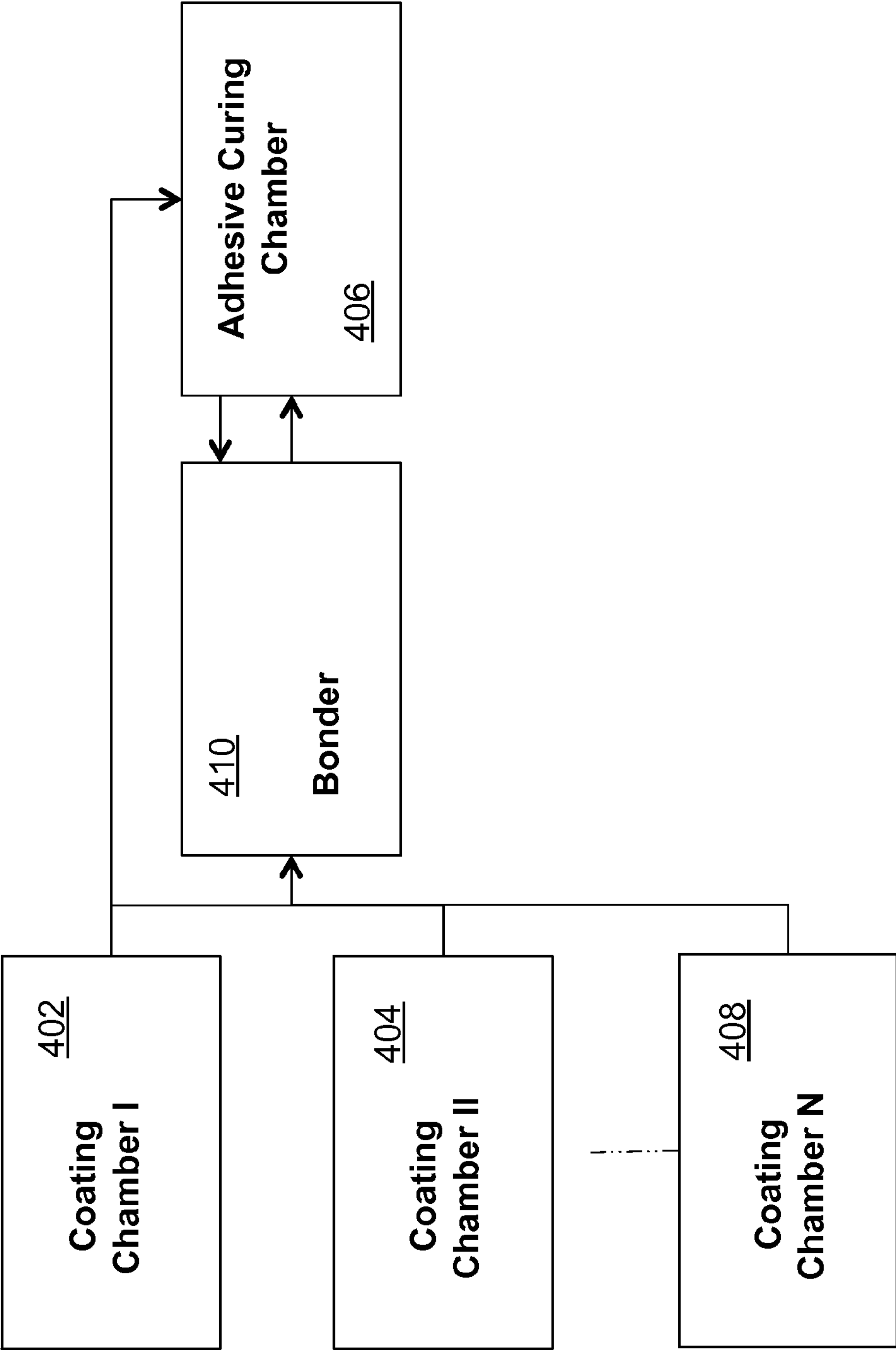


FIG. 8

METHOD AND APPARATUS FOR TEMPORARY BONDING OF ULTRA THIN WAFERS

CROSS REFERENCE TO RELATED CO-PENDING APPLICATIONS

[0001] This application is a divisional application and claims the benefit of U.S. application Ser. No. 13/790,684 filed Mar. 8, 2013 and entitled "METHOD AND APPARATUS FOR TEMPORARY BONDING OF ULTRA THIN WAFERS", the contents of which are expressly incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to a method and an apparatus for temporary bonding of ultra thin wafers, and more particularly to temporary wafer bonding that includes a dual coating and dual curing process.

BACKGROUND OF THE INVENTION

[0003] Several semiconductor wafer processes include wafer thinning steps. In some applications the wafers are thinned down to a thickness of less than 100 micrometers for the fabrication of integrated circuit (IC) devices. Thin wafers have the advantages of improved heat removal and better electrical operation of the fabricated IC devices. In one example, GaAs wafers are thinned down to 25 micrometers to fabricate power complementary metal oxide semiconductor (CMOS) devices with improved heat removal. Wafer thinning also contributes to a reduction of the device capacitance and to an increase of its impedance, both of which result in an overall size reduction of the fabricated device. In other applications, wafer thinning is used for 3D-Integration bonding and for fabricating through wafer vias.

[0004] Wafer thinning is usually performed via back-grinding and/or chemical mechanical polishing (CMP). CMP involves bringing the wafer surface into contact with a hard and flat rotating horizontal platter in the presence of liquid slurry. The slurry usually contains abrasive powders, such as diamond or silicon carbide, along with chemical etchants such as ammonia, fluoride, or combinations thereof. The abrasives cause substrate thinning, while the etchants polish the substrate surface at the submicron level. The wafer is maintained in contact with the abrasives until a certain amount of substrate has been removed in order to achieve a targeted thickness.

[0005] For wafer thicknesses of over 200 micrometers, the wafer is usually held in place with a fixture that utilizes a vacuum chuck or some other means of mechanical attachment. However, for wafer thicknesses of less than 200 micrometer and especially for wafers of less than 100 micrometers, it becomes increasingly difficult to mechanically hold the wafers and to maintain control of the planarity and integrity of the wafers during thinning In these cases, it is actually common for wafers to develop microfractures and to break during CMP.

[0006] An alternative to mechanical holding of the wafers during thinning involves attaching a first surface of the device wafer (i.e., wafer processed into a device) onto a carrier wafer and then thinning down the exposed opposite device wafer surface. The bond between the carrier wafer and the device wafer is temporary and is removed upon completion of the thinning and any other processing steps.

[0007] Several temporary bonding techniques have been suggested including using of adhesive compounds that are thermally cured. In these adhesive based temporary bonding techniques a wet thick adhesive layer is applied onto the device wafer surface so that it covers all the structures of the device wafer surface including solder bumps, connectors, and integrated circuit (IC) devices. The wet adhesive layer has a typical thickness in the range of in the range of 25 to 150 micrometers. The wet adhesive layer is then brought into contact with the carrier wafer surface and the adhesive is then cured thereby resulting in bonding the device wafer to the carrier wafer. As was mentioned the bond is temporary and can be removed by dissolving the adhesive layer after processing by using chemicals, heat or radiation.

[0008] One of the problems with this process is that the thick adhesive layer causes high total thickness variations (TTV) in the wafer surface planarity. A primary TTV influence comes from the post-join thermal curing process. In particular, the thickness of the post-join adhesive layer directly correlates to the TTV error magnitude. Furthermore, a thick wet adhesive layer increases the risk of "squeezing-out" of the adhesive from the sides during the wafer joining step in the uncured state. Accordingly, it is desirable to reduce the thickness of the adhesive layer that is used for temporary bonding of thinned wafers.

SUMMARY OF THE INVENTION

[0009] The present invention relates to a method and an apparatus for temporary bonding and fabrication of ultra thin wafers, and more particularly to temporary wafer bonding that includes a dual coating and dual curing process.

[0010] In general, in one aspect, the invention features a method for temporary bonding two wafer surfaces including the following. First providing a first wafer comprising first and second wafer surfaces opposite to each other. Next, providing a second wafer comprising first and second wafer surfaces opposite to each other. Next, applying a first adhesive layer upon the first surface of the first wafer. Next, curing the first adhesive layer, thereby producing a cured first adhesive layer. Next, applying a second adhesive layer upon the first surface of the second wafer. Next, providing a bonder module comprising an upper chuck assembly and a lower chuck assembly arranged below and opposite the upper chuck assembly. Next, inserting the first wafer into the bonder module and holding the first wafer by the upper chuck assembly so that its first surface with the cured first adhesive layer faces down. Next, inserting the second wafer into the bonder module and placing the second wafer upon the lower chuck assembly so that the second adhesive layer faces up and is opposite to the first adhesive layer. Next, moving the lower chuck assembly upwards and bringing the second adhesive layer in contact with the cured first adhesive layer, and then curing the second adhesive layer, thereby forming a temporary bond between the first and second wafers.

[0011] Implementations of this aspect of the invention may include one or more of the following features. The second adhesive layer is cured by bringing a hot plate in contact with the second surface of the second wafer. The first adhesive layer is applied upon the first surface of the first wafer via spin coating. The first adhesive layer comprises a silicone elastomer. The curing of the first and second adhesive layers occurs at a curing temperature in the range of 80° C. to 160° C. and a curing time in the range of 1-15 minutes. The upper and lower chuck assemblies comprise low force upper and

lower chucks, respectively, and the second adhesive layer is brought in contact with the cured first adhesive layer by first evacuating the bonder module and then bringing the bonder module to atmospheric pressure via purging. The method further includes curing the temporary bonded first and second wafers. The curing of the temporary bonded first and second wafers occurs at a curing temperature in the range of 120° C. to 220 ° C. and a curing time in the range of 1 to 15 minutes. The method further includes thinning the second surface of the first wafer and then debonding the thinned first wafer from the second wafer.

[0012] In general, in another aspect, the invention features an apparatus for temporary bonding two wafer surfaces including a first coating chamber, a second coating chamber, a curing chamber and a bonder module. The first coating chamber is configured to apply a first adhesive layer upon a first surface of a first wafer. The second coating chamber is configured to apply a second adhesive layer upon a first surface of a second wafer. The curing chamber is configured to cure the first adhesive layer of the first wafer. The bonder module includes an upper chuck assembly and a lower chuck assembly arranged below and opposite the upper chuck assembly. The upper chuck assembly is configured to hold the first wafer so that its first surface with the cured first adhesive layer faces down. The lower chuck assembly is configured to hold the second wafer so that the second adhesive layer faces up and is opposite to the cured first adhesive layer. The lower chuck assembly is configured to move upwards and thereby to bring the second adhesive layer in contact with the cured first adhesive layer. The curing chamber is further configured to cure the second adhesive layer by bringing a hot plate in contact with a second surface of the second wafer, thereby forming a temporary bond between the first and second wafers. The upper and lower chuck assemblies comprise low force upper and lower chucks, respectively, and the second adhesive layer is brought in contact with the cured first adhesive layer by first evacuating the bonder module and then bringing the bonder module to atmospheric pressure via purging.

[0013] In general, in another aspect, the invention features a method for temporary bonding two wafer surfaces including the following. Providing a first wafer comprising first and second wafer surfaces opposite to each other. Providing a second wafer comprising first and second wafer surfaces opposite to each other. Applying a first adhesive layer upon the first surface of the first wafer. Next, curing the first adhesive layer, thereby producing a cured first adhesive layer. Next, applying a second adhesive layer upon the cured first adhesive layer. Providing a bonder module comprising an upper chuck assembly and a lower chuck assembly arranged below and opposite the upper chuck assembly. Inserting the first wafer into the bonder module and holding the first wafer by the upper chuck assembly so that its first surface with the cured first adhesive layer and the second adhesive layer faces down. Next, inserting the second wafer into the bonder module and placing the second wafer upon the lower chuck assembly so that the first surface of the second wafer faces up and is opposite to the second adhesive layer. Next, moving the lower chuck assembly upwards and bringing the first surface of the second wafer in contact with the second adhesive layer, and then curing the second adhesive layer, thereby forming a temporary bond between the first and second wafers.

[0014] In general, in another aspect, the invention features an apparatus for temporary bonding two wafer surfaces including a first coating chamber, a curing chamber, a second coating chamber and a bonder module. The first coating chamber is configured to apply a first adhesive layer upon a first surface of a first wafer. The curing chamber is configured to cure the first adhesive layer of the first wafer, thereby producing a first cured adhesive layer. The second coating chamber is configured to apply a second adhesive layer upon the first cured adhesive layer. The bonder module comprises an upper chuck assembly and a lower chuck assembly arranged below and opposite the upper chuck assembly. The upper chuck assembly is configured to hold the first wafer so that its first surface with the cured first adhesive layer and the second adhesive layer faces down. The lower chuck assembly is configured to hold a second wafer so that a first surface of the second wafer faces up and is opposite to the second adhesive layer. The lower chuck assembly is configured to move upwards and thereby to bring the first surface of the second wafer in contact with the second adhesive layer. The curing chamber is further configured to cure the second adhesive layer, thereby forming a temporary bond between the first and second wafers.

[0015] In general in another aspect, the invention features a method for temporary bonding two wafer surfaces including the following. Providing a first wafer comprising first and second wafer surfaces opposite to each other. Providing a second wafer comprising first and second wafer surfaces opposite to each other. Applying a first adhesive layer upon the first surface of the first wafer. Next, curing the first adhesive layer, thereby producing a cured first adhesive layer. Next, applying a second adhesive layer upon the first surface of the second wafer. Providing a bonder module comprising an upper chuck assembly and a lower chuck assembly arranged below and opposite the upper chuck assembly. Next, inserting the first wafer into the bonder module and placing the first wafer upon the lower chuck assembly so that its first surface with the cured first adhesive layer faces up. Next, inserting the second wafer into the bonder module and holding the second wafer by the upper chuck assembly so that the second adhesive layer faces down and is opposite to the first adhesive layer. Next, moving the lower chuck assembly upwards and bringing the first adhesive layer in contact with the second adhesive layer. Finally, curing the second adhesive layer, thereby forming a temporary bond between the first and second wafers.

[0016] In general in another aspect, the invention features a method for temporary bonding two wafer surfaces including the following. Providing a first wafer comprising first and second wafer surfaces opposite to each other. Providing a second wafer comprising first and second wafer surfaces opposite to each other. Applying a first adhesive layer upon the first surface of the first wafer. Next, curing the first adhesive layer, thereby producing a cured first adhesive layer. Next, applying a second adhesive layer upon the first surface of the second wafer. Next, bringing the first adhesive layer in contact with the second adhesive layer. Finally, curing the second adhesive layer, thereby forming a temporary bond between the first and second wafers.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] Referring to the figures, wherein like numerals represent like parts throughout the several views:

[0018] FIG. **1A** is a schematic diagram of first example of a temporary wafer bonding process and a debonding process;

[0019] FIG. **1**B is a schematic diagram of second example of a temporary wafer bonding process and a debonding process;

[0020] FIG. **2** depicts a schematic cross-sectional view of a bonder and a list of the process steps for performing the temporary wafer bonding process of FIG. **1**A and FIG. **1**B;

[0021] FIG. **3** depicts a schematic cross-sectional side view of the laser debonding step of FIG. **1**A;

[0022] FIG. **4** depicts a schematic cross-sectional side view of the mechanical debonding step of FIG. **1**A and FIG. **1**B;

[0023] FIG. **5** is a schematic diagram of the detaping process of FIG. **1**A and FIG. **1**B;

[0024] FIG. **6**A and FIG. **6**B are schematic diagrams of the dual coat and dual cure temporary bonding process, according to this invention;

[0025] FIG. **7** depicts post bond TTV results achieved with the dual coat and dual cure temporary bonding process, according to this invention; and

[0026] FIG. **8** is an overview block diagram of the dual coat and dual cure temporary bonder system according to this invention.

DETAILED DESCRIPTION OF THE INVENTION

[0027] Referring to FIG. **1**A, temporary bond process **80***a* includes the following steps. First, a surface of the device wafer **20** is coated with an adhesive layer **23** (**82**). In one example, adhesive layer **23** is a UV curable adhesive LC3200™, manufactured by 3M Company, MN, USA. The adhesive coated device wafer is then flipped (**84**). Next, a light absorbing release layer **33** is spin coated on a surface **30***a* of the carrier wafer **30** (**86**). In one example, light absorbing release layer **33** is a LC4000, manufactured by 3M Company, MN, USA. Next, the flipped device wafer **20** is aligned with the carrier wafer **30** so that the surface **20***a* of the device wafer with the adhesive layer **23** is opposite to the surface **30***a* of the carrier wafer **30** with the light absorbing release layer **33**. The two surfaces **20***a* and **30***a* are brought into contact and the adhesive layer **23** is cured with UV light (**87**). The two wafers are bonded (**88**) in temporary bonder **410**, shown in FIG. **2**. The bond is a temporary bond between the light absorbing release layer **33** and the adhesive layer **23** and is formed under vacuum of 0.1 mbar and low applied bond force.

[0028] Referring to FIG. **2**, the carrier wafer **30** with the laser absorbing release layer LTHC layer **33** is placed on the top chuck **412** and held in place by holding pins **413**. Next, the device wafer **20** is placed on the bottom chuck **414** with the adhesive layer **23** facing up. Next, the wafers **20**, **30** are aligned, the chamber is evacuated, and the top chuck **412** with the carrier wafer **30** is dropped onto the device wafer **20**. A low force is applied for the formation of the bond between the release layer **33** and the adhesive layer **23**. Next, the bonded wafer stack **10** is unloaded and the adhesive is cured with UV light. In other embodiments, the carrier wafer **30** is placed on the bottom chuck **414** and the device wafer **20** is placed on the top chuck **412**. In other embodiments, the adhesive layer is thermally cured by bringing the wafers in contact with a hot plate or via thermal radiation.

[0029] Next, the temporary bonded wafer stack **10** is placed in a CMP chamber and the back surface of the device wafer **20** is thinned via CMP. After the thinning process, the wafer stack **10** is debonded via the debond process **80***b*.

[0030] Referring back to FIG. **1**A, the debond process **80***b* includes the following steps. The bonded wafer stack **10** is mounted onto a dicing frame **25** (**56**) and the carrier wafer **30** is illuminated with a YAG laser beam, as shown in FIG. **3**. The laser beam causes the separation of the wafer stack along the release layer **33** (**57**) and the separated carrier wafer **30** is mechanically lifted away from the device wafer **20** (**58**) by pushing edge **31** away, as shown in FIG. **4**. The laser debonding process is a low stress process that utilizes no chemicals and is carried out at room temperature. The mechanical debonding process utilizes very low force. After separation the carrier is recycled, cleaned and reused again. The mechanical debonding operation is described in co-pending application Ser. No. 12/761,014 entitled "Apparatus for mechanically debonding temporary bonded semiconductor wafers" the contents of which are incorporated herein by reference. The adhesive layer **23** is then peeled away from the device wafer surface **20***a* (**59**) and the thinned device wafer **20** remains supported by the dicing frame **25**. Referring to FIG. **5**, a detaping tape **155** is applied on top of the exposed adhesive layer **23**. In one example detaping tape **155** is tape 3305 manufactured by 3M Company. Tape 3305 is a transparent polyester film tape with an aggressive rubber adhesive specifically designed for the removal of silicon backgrinding tape. The detaping tape **155** is pressed onto and attached to the adhesive layer **23** and when the tape **155** is peeled away the adhesive layer **155** is also peeled away from the surface **20***a* of the device wafer **20**. Chemical cleaning may be used to remove any remaining adhesive residue from the device wafer surface **20***a*. However, the adhesive residue levels on the device wafer **20** after the removal of the adhesive layer **23** with the detaping process **150** are minimal and usually no post-peel cleaning is required. Removal of the adhesive layer with the detaping process creates very little stress to the thinned wafer and is compatible with low-k dielectrics.

[0031] Referring to FIG. **1**B, in another example, the temporary bonding process **80***c* includes the following steps. First, the device wafer **20** is coated with a very thin layer **21** of a precursor which subsequently is transformed to a "release layer" **21***a* via a plasma enhanced chemical vapor deposition process (PECVD). The total thickness of the finished "release layer" **21** is around 100 nm. Low plasma energy of about 10 Watts keeps the wafer at room temperature. By varying the plasma parameters the adhesion force of the release layer **21** can be modified. In the next step, the carrier wafer **30** is spin-coated with a thicker layer **23** of an elastomer in order to cover any topography of the device wafer. Layer thicknesses from about 60 μm up to 200 μm are possible within one coating step. The elastomer is a liquid, highly viscose material. The mechanical properties of the elastomer after bonding and curing allow the grinding wheel to back grind the elastomer outside the wafer rim as well. In the next step, the device wafer **20** is bonded to the carrier wafer **30** using the above described low force bonding process. Both samples are placed into the bond chamber **410** in a center-to-center aligned position with a separation from each other of about 10 mm. The device wafer **20** is coated with the very thin release layer **21** of about 100 nm thickness and the carrier wafer **30** is coated with the much thicker elastomer **23** (approximately 100 μm). The elastomer **23** at this point in time is still liquid, forming an edge bead of some 10 μm at the outer rim of the carrier wafer. After evacuating the bond chamber **410** the two wafers **20**, **30** are brought into contact, the upper device wafer **20** first touching the elastomer **23** on the carrier wafer **30** on the top of the edge bead, thus sealing an inner chamber between both samples. By purging the bond chamber, both samples are pressed together just by the atmospheric pressure

in the bond chamber **410**, without any mechanical forces touching the wafer. Next, the bonded wafer stack **10** is thinned via CMP and then the thinned device wafer **20** is debonded from the carrier wafer **30**. In this case, de-bonding is done in a purely mechanical way. The wafer stack **10** is mounted to a dicing tape which is held on a dicing frame with the thinned wafer side being adhered to the tape. Using a flat, porous plate the thinned wafer mounted onto the tape is sucked down by vacuum. This assembly keeps the sensitive thinned wafer in a fixed, flat and very stable position. By means of a slightly flexible, soft bendable vacuum chuck the carrier wafer **30** can be taken off by lifting it from one side, as shown in FIG. **1**B.

[0032] As was mentioned above, one of the problems with these temporary bonding processes **80***a*, **80***c* is that the adhesive layer **23** is thick (in the range of 25 to 150 micrometers) and this causes high total thickness variations (TTV) in the device wafer surface planarity. A primary TTV influence comes from the post-join curing process. Actually, the thickness of the post-join adhesive layer correlates to the TTV error magnitude. Furthermore, a thick wet adhesive layer increases the risk of "squeezing-out" from the sides during the wafer joining step (**84**) in the uncured state. The present invention addresses these problems by applying a process that includes dual coating steps and dual curing steps.

[0033] Referring to FIG. **6**A, the dual coating/dual curing process **300** of this invention includes the following steps. In the first coating step **310**, the device wafer **20** is spin coated with the wet adhesive layer **23***a* so that the solder bumps **20***a* are covered, as shown in FIG. **6**A. The device wafer **20** may also include a release layer **21**, as was described above. In one example, the solder bumps **20***a* have a height **62** of 80 micrometers and the adhesive layer **23***a* is deposited so that the thickness **61** of the adhesive layer above the solder bumps is about 25 micrometers. In the subsequent first curing step **330**, the wet adhesive layer **23***a* on the device wafer **20** is cured, thereby resulting in a cured adhesive layer **23***a* having a total thickness **64** of 105 micrometers. In one example, the curing temperature is 120° C. and the curing time is 10 minutes for the first curing step **330**. In the second coating step **320**, the carrier wafer **30** is spin coated with a thin wet adhesive layer **23***b*. In one example, the thickness **65** of the wet adhesive layer **23***b* is 25 micrometers. The thickness of the wet adhesive layer **23***b* may be further decreased by changing the coating process parameters or the coating composition. In the next step **340**, the device wafer **20** with the cured adhesive layer **23***a* is placed in the bonder **410** so that it is held by the top chuck **412** and the carrier wafer **30** with the wet adhesive layer **23***b* is placed on the bottom chuck **414**, so that the wet adhesive layer **23***b* is opposite to the cured adhesive layer **23***a*, as shown in FIG. **6**A and FIG. **6**B. As was mentioned above, both the top **412** and bottom **414** chucks are low force chucks. The bonder chamber **410** is pumped down to a level of 10 mbar. Next, the lower chuck **414** moves up along direction **415** and the two adhesive layers **23***a* and **23***b* are brought into contact with each other in order to form a joined wafer stack **10** (**350**), as shown in FIG. **6**B. The bonder chamber **410** is then vented and brought to atmospheric pressure and then the joined wafer stack **10** is removed. In the next step **360**, the joined wafer stack **10** is placed in the curing chamber **406** (shown in FIG. **6**B and FIG. **8**) in order for the second cure step to take place. In this second cure step **360**, a hot plate **416** is brought into contact with the backside of the carrier wafer **30** and the wet adhesive layer **23***b* is cured, thereby resulting in temporary bonding the carrier wafer **30** to the device wafer **20**. In one example, the curing temperature for this second curing step is also 120° C. and the time is about 15 minutes. A final cure step (not shown) is also applied to ensure that all adhesive layers **23***a*, **23***b* are fully cured. The final curing temperature is 190° C. and the time is 10 minutes. In the next steps, the bonded wafer stack **10** is thinned via CMP and then the thinned device wafer **20** is debonded from the carrier wafer **30**, as was described above.

[0034] In one example the device wafer **20** has a thickness of 775 micrometers (without the solder bumps), the solder bumps have a height of 80 micrometers. The carrier wafer **30** is a blank silicon wafer having a thickness of 775 micrometers or a glass wafer with a thickness of 600 micrometers. The adhesive is a silicone elastomer TMAT 3.2 supplied by Thin Materials AG, Munich Germany. The temporary bonding equipment **410** is bonder XBS 300 supplied by Suss Microtec, Garching Germany. Surface metrology is provided by the integrated XBS 300 laser displacement thickness measurement or by a surface metrology instrument provided by Foothill Instruments for measuring coating uniformity on a blank wafer. FIG. **7** depicts typical post bond TTV results.

[0035] In other embodiments, wet adhesive layer **23***b* is applied to the cured adhesive layer **23***a* instead of to the carrier wafer **30**. In all cases, no squeeze-out of the adhesive on any bonded wafer pair was observed. A plurality of coating modules **402**, **404**, **408** may be used in order to improve throughput of the process, as shown in FIG. **8**.

[0036] Several embodiments of the present invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. Accordingly, other embodiments are within the scope of the following claims.

1. An apparatus for temporary bonding two wafer surfaces comprising:

a first coating chamber configured to apply a first adhesive layer upon a first surface of a first wafer;

a second coating chamber configured to apply a second adhesive layer upon a first surface of a second wafer;

a curing chamber configured to cure the first adhesive layer of the first wafer;

a bonder module comprising an upper chuck assembly and a lower chuck assembly arranged below and opposite the upper chuck assembly;

wherein said upper chuck assembly is configured to hold said first wafer so that its first surface with the cured first adhesive layer faces down;

wherein said lower chuck assembly is configured to hold said second wafer so that said second adhesive layer faces up and is opposite to said cured first adhesive layer;

wherein said lower chuck assembly is configured to move upwards and thereby to bring said second adhesive layer in contact with said cured first adhesive layer; and

wherein said curing chamber is further configured to cure said second adhesive layer, thereby forming a temporary bond between said first and second wafers.

2. The apparatus of claim **1**, wherein said curing chamber is configured to cure said second adhesive layer by bringing a hot plate in contact with a second surface of the second wafer.

3. The apparatus of claim **1**, wherein said curing chamber is configured to cure said first and second adhesive layers via at least one of Ultraviolet (UV), thermal, pressure, catalytic, chemical or time induced curing process.

4. The apparatus of claim **1**, wherein the upper and lower chuck assemblies comprise low force upper and lower chucks, respectively, and wherein the second adhesive layer is brought in contact with said cured first adhesive layer by first evacuating the bonder module and then bringing the bonder module to atmospheric pressure via purging.

5. The apparatus of claim **1**, wherein said first adhesive layer is applied upon said first surface of the first wafer via spin coating.

6. The apparatus of claim **1**, wherein said first adhesive layer comprises a silicone elastomer.

7. The apparatus of claim **1**, wherein said curing of the first and second adhesive layers occurs at a curing temperature in the range of 80° C. to 160° C. and a curing time in the range of 1 to 15 minutes.

8. The apparatus of claim **1**, wherein said curing chamber is further configured to cure said temporary bonded first and second wafers.

9. The apparatus of claim **8**, wherein said curing of said temporary bonded first and second wafers occurs at a curing temperature in the range of 120° C. to 220° C. and a curing time in the range of 1 to 15 minutes.

10. The apparatus of claim **1**, wherein said first adhesive layer comprises a thickness of less than 110 micrometers and wherein said second adhesive layer comprises a thickness of less than 30 micrometers.

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