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- (71) **Applicant** (for all designated States except US):
THERMAL CONDUCTIVE BONDING, INC. [US/US];
19 Great Oaks Blvd., San Jose, CA 95119 (US).
- (72) **Inventors; and**
- (75) **Inventors/Applicants** (for US only): **SCATENA, Ryan, A.** [US/US]; 2400 Olea Ct., Gilroy, CA 95020 (US).
SIMPSON, Wayne, R. [US/US]; 23735 Mckean Rd., San Jose, CA 95141 (US).
- (74) **Agent:** **PAGEL, Donald, J.**; Law Office of Donald J. Pagel, 586 N. First Street, Suite 207, San Jose, CA 95112 (US).
- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

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(54) **Title:** ELASTOMER BONDED ITEM AND METHOD FOR DEBONDING

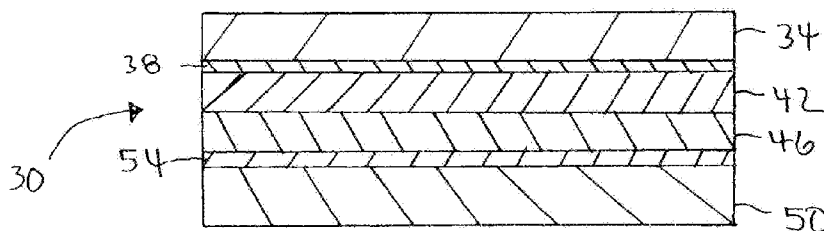


Fig. 2

(57) **Abstract:** An item (10, 30), such as a sputtering target assembly or an electrostatic chuck, comprised of a first substrate (14, 34); a metallization layer (18, 38) adhered to a surface of the first substrate; a second substrate (26, 50); and an elastomer layer (22, 42) positioned between the metallization layer and the second substrate. In another embodiment, a debonding layer (46), such as a solder material, is positioned between the elastomer layer and the second substrate for allowing the item to be disassembled after use by heating the item up to the approximate melting point of the debonding layer.

ELASTOMER BONDED ITEM AND METHOD FOR DEBONDING

BACKGROUND ART

The use of elastomeric materials to attach components together is well known in
5 the art, particularly in the semiconductor manufacturing industry. For example, U.S. Pat.
No. 6,194,322 describes an electrode for use in a plasma reaction chamber that is bonded
to a support member using an elastomer. Similarly, U.S. published patent application
number US 2006/0272941 A1 (published December 7, 2006), describes a methodology
for manufacturing large area sputtering target assemblies in which the sputtering target is
10 held to the backing plate with an elastomer. As new semiconductor manufacturing
processes are developed, improvements in elastomer bonding technology are needed.

SUMMARY OF THE INVENTION

Briefly, the present invention comprises an item, such as a sputtering target
15 assembly, a showerhead electrode or an electrostatic chuck, comprised of a first substrate;
a metallization layer adhered to a surface of the first substrate; a second substrate; and an
elastomer layer positioned between the metallization layer and the second substrate. The
use of the metallization layer improves the bond between the first substrate and the
elastomer layer.

20 In another embodiment, a debonding layer is positioned between the elastomer
layer and the second substrate for allowing the item to be disassembled after use by
heating the item up to the approximate melting point of the debonding layer. Generally,
the debonding layer comprises a material having a melting point in the range of 75 to 250
°C. The preferred material for use in the debonding layer 46 is a solder material, such as
25 indium, tin, bismuth, and solder alloys containing these materials.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 is a cross-sectional view of an elastomer bonded item according to the present invention; and

Fig. 2 is cross-sectional view of an elastomer bonded item that includes a debonding layer according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 illustrates an item 10 that comprises a substrate 14, a metallization layer 18, an elastomer layer 22 and a substrate 26. In many situations, the substrates 14 and 26 must be strongly bonded together without gaps in the layer or layers that hold the substrates 14 and 26 together. Such gaps could, for example, weaken the bond or provide a pathway for electrical arcing, or for the passage of gases or fluids, between the substrates 14 and 26.

In the present invention, the substrate 14 is comprised of a material that for some reason does not form a satisfactory bond directly with the elastomer layer 22. The unsatisfactory bond may result from insufficient adhesion between the substrate 14 and the elastomer layer 22, from the formation of gaps between the substrate 14 and the elastomer layer 22, or for other reasons. To improve the quality of the bond between the substrate 14 and the elastomer layer 22, the metallization layer 18 is interposed between the substrate 14 and the elastomer layer 22.

In a preferred embodiment, the metallization layer 18 is applied to a surface of the substrate 14 before the substrates 14 and 26 are bonded together. The elastomer layer 22 is then applied between the metallization layer 18 (which is now part of the substrate 14) and the substrate 26. The elastomer is allowed to cure before the item 10 is ready for use.

The substrate 14 can be comprised of any material that does not form a

satisfactory bond directly with the elastomer layer 22 and could be used for any purpose. For example, representative materials that can be used as the substrate 14 include gold or a ceramic material. Representative functions for the substrate 14 after the item 10 is formed include sputtering targets, showerhead electrodes and electrostatic chucks.

5 The metallization layer 18 can be comprised of many metals, such as aluminum, titanium, chrome, nickel, copper or solder materials, such as indium, tin, bismuth, and solder alloys containing these materials. The metallization layer 18 can be applied to the substrate 14 by any suitable technique, such as sputtering, plating anodizing or ultrasonic wetting.

10 The elastomer layer 22 can be comprised of many types of elastomers. In general, an elastomer is a substance (preferably a polymer) having elastic properties. Preferred types of elastomers that can be used in the elastomer layer 22, include a silicone elastomer or a poly(dimethylsiloxane) elastomer, such as Sylgard® 184 brand silicone elastomer sold by Dow Corning. Poly(dimethylsiloxane) elastomer (PDMS) is
15 a silicone elastomer comprised of a Si-O-Si backbone with each silicon atom bearing two methyl (Me) groups. PDMS is typically denoted as (Me₂SiO)_n.

 Other types of elastomers that can be used in the elastomer layer 22 are the fluoroelastomers referred to as FKMs (also known as FPMs) and the perfluoroelastomers referred to as FFKMs (also known as FFPMs). FKMs are
20 copolymers that contain monomer units of vinylidene fluoride (CH₂=CF₂) and a comonomer, such as hexafluoropropylene (HFP), tetrafluoroethylene (TFE), perfluoromethylvinylether (PMVE), propylene or ethylene. FKMs have very good resistance to heat and chemicals and are sold commercially under trademarks such as Viton™, Dai-El™, Dyneon™ and Tecnoflon™).

FFKMs are terpolymers comprised of tetrafluoroethylene ($\text{CF}_2=\text{CF}_2$), and usually PMVE and another monomer. Because FFKMs are highly fluorinated polymers, they have exceptionally good resistance to chemicals along with the elastic properties of FKMs. FFKMs are sold commercially under trademarks such as

5 Chemraz™ and Kalrez™.

Additional types of suitable elastomers that can be used as the elastomer layer 22 include polyimide, polyketone, polyetherketone, polyether sulfone, polyethylene terephthalate, and fluoroethylene propylene copolymers. Flexible epoxy or rubber can also be used. Other silicone elastomers that can be used include the products marketed as

10 General Electric RTV 31 and General Electric RTV 615 brand silicone elastomers.

The substrate 26 can be comprised of any suitable material that bonds directly with the elastomer layer 22 and can be used for any purpose. Representative functions for the substrate 26 after the item 10 is formed include backing plates and/or cooling plates. Aluminum is a preferred material for the substrate 26.

15 In a representative example, the item 10 is a sputtering target assembly used to deposit thin films on objects like semiconductor devices, glass or other substrates requiring a thin film. The substrate 14 is a sputtering target comprised of gold, the metallization layer 18 comprises titanium and aluminum applied to the backside of the substrate layer 14 by sputtering. The elastomer layer 22 comprises the PDMS elastomer,

20 such as the elastomer sold by Dow Corning under the product name/designation Sylgard® 184. The substrate 26 is a backing plate comprised of copper which is cooled with water during use. The use of the metallization layer 18 improves the bond with the elastomer layer 22 so that delamination does not occur between the substrate 14 and 26 during the sputtering process.

25 The PDMS elastomer in the elastomer layer 22 may be applied between the

substrate 14 and the substrate 26 using any suitable procedure. For example, U.S. published patent application number US 2006/0272941 A1 (published December 7, 2006), which is incorporated herein by reference, describes how a sputtering target can be attached to a backing plate using an elastomer layer comprised of Sylgard® 184. In a
5 representative embodiment of the present invention, the Sylgard® 184 PDMS elastomer in the elastomer layer 22 is applied between the metallization layer 18 and the substrate 26 using the following procedure:

The surfaces of the metallization layer 18 and the substrate 26 that will be in contact with the elastomer layer 22 are primed to promote adhesion with the elastomer to
10 the layer 18, such as by coating the surfaces with Dow Corning Primer 1200, or a similar chemical. At this time, a piece of copper mesh (i.e. copper screen) is primed, for example by coating the surface of the copper mesh with Dow Corning Primer 1200, or a similar chemical. The copper mesh is cut to size so that it is approximately 0.100 inches shorter than the substrate 14 in both length and width directions.

15 After the recommended wait time for allowing the primer to dry, the Sylgard® 184 is mixed according to the manufacturer's instructions. Aluminum powder filler is added to the elastomer in a ratio of 1:1 by weight of the A component of elastomer (Sylgard® 184). The elastomer/aluminum powder mixture is thoroughly mixed and degassed in a vacuum degassing chamber to remove air bubbles. The elastomer mixture is
20 then uniformly applied to the surfaces of the metallization layer 18 and the substrate 26 that were previously primed.

The piece of primed copper mesh is then placed on the elastomer that is covering the substrate 26. The substrate 14 is then placed on the substrate 26 with the elastomer coated on the metallization layer 18 being brought into contact with the elastomer coated
25 on the substrate 26. Pressure is applied to the substrate 14 to hold the item 10 together

while the elastomer cures, such as by applying four pounds per square inch (PSI) on the substrate 14, either by weight or clamping. Heat is then applied to the item 10 to cure the elastomer. Generally, the conditions needed to cure the elastomer (such as temperature and time) are specified by the manufacturer of the elastomer. After the elastomer has cured, the pressure is removed and the elastomer bond is sufficiently strong to hold the item 10 together in a plasma environment, such as the environment that exists inside a plasma etch chamber.

The purpose of the aluminum powder and the piece of copper mesh inserted into the elastomer layer is to facilitate the transfer of heat from the substrate 14 to the substrate 26. In some embodiments, the copper mesh and/or the aluminum powder is not needed and one or both of these components can be deleted.

In one embodiment, the present invention is an item comprised of a first substrate (such as the substrate 14); a metallization layer (such as the metallization layer 18) adhered to a surface of the first substrate; a second substrate (such as the substrate 26); and an elastomer layer (such as the elastomer layer 22) positioned between the metallization layer and the second substrate. The first substrate and the second substrate are held together by the elastomer layer without the need for additional attachment means to hold the first substrate and the second substrate together. The elastomer layer is sufficiently strong to hold the first substrate and the second substrate together in a plasma environment, such as the environment that exists inside a plasma etch chamber.

Referring to Fig. 1, in many situations, at some point after the item 10 (has been formed, there is a need to take the substrates 14 and 26 apart (i.e. to debond the item 10). Debonding might be necessary to replace or repair one of the substrates 14 or 26 or for some other reason. However, since the elastomers used in the elastomer layer 22 have fairly high failure points (e.g. >250 °C), it is frequently not desirable to heat the

item 10 up to a temperature where the elastomer will fail because high temperatures may damage one or both of the substrates 14 or 26. A solution to this problem is illustrated in Fig. 2.

Fig. 2 illustrates an item 30 that comprises a substrate 34, a metallization layer 38, an elastomer layer 42, a debonding layer 46 and a substrate 50. In some
5 embodiments, a wetting or metallization layer 54 is positioned between the substrate 50 and the debonding layer 46 to help the debonding layer 46 better adhere to the substrate 50. However, use of the layer 54 is optional. Use of the debonding layer 46 provides a method for debonding substrates 34 and 50, meaning that the substrates 34 and 50 can
10 be separated from each other. In a preferred embodiment, the debonding layer 46 comprises a material with a relatively low melting point. Since the materials used in the debonding layer 46 melt at lower temperatures (e.g. 75 to 250 °C) than the elastomer layer 42, the item 30 can be debonded (taken apart) by heating to the temperature where the material in the debonding layer melts or ceases to hold the item
15 30 together. Once the substrates 34 and 50 have been separated, the elastomer layer 42 can be removed, for example, by scraping the elastomer off of the substrate 34 if this is desired.

In Fig. 2, the substrate 34 is analogous to the substrate 14 described previously with respect to Fig. 1, meaning that the materials and/or functions described previously
20 for the substrate 14 apply to the substrate 34. Similarly, the metallization layer 38, the elastomer layer 42 and the substrate 50 shown in Fig. 2 are analogous to the metallization layer 18, the elastomer layer 22 and the substrate 26, respectively, shown in Fig. 1.

The debonding layer 46 comprises any suitable low melting material, and
25 preferably has a melting point in the range of 75 to 250 °C, and more preferably in the

range of 75 to 232 °C. However, the preferred material for use in the debonding layer 46 is a solder material. Any suitable solder material can be used, but solder materials such as indium, tin, bismuth, and solder alloys containing these materials are preferred for use in the debonding layer 46.

5 In a representative example, the item 30 is an electrostatic chuck assembly. The substrate 34 comprises an electrostatic chuck (ESC) used to hold a semiconductor wafer in place during processing. The electrostatic chuck comprises a ceramic material such as aluminum oxide. The metallization layer 38 comprises titanium and aluminum applied to the backside of the substrate 34 by sputtering. The debonding layer 46 comprises tin and
10 the elastomer layer 42 comprises a PDMS elastomer, such as the elastomer sold by Dow Corning under the product name/designation Sylgard® 184. The substrate 50 is a cooling plate comprised of aluminum. The use of the metallization layer 38 improves the bond between the substrate 34 and the elastomer layer 42. The wetting layer 54 is comprised of tin and helps the debonding layer 46 adhere to the substrate 50. The debonding layer 46
15 allows the substrate 34 to be separated from the substrate 50 by heating the item 30 to a temperature that does not damage the substrates 34 and/or 50.

The item 30 is assembled using the following procedure: The metallization layer 38 (titanium and aluminum) is applied to a backside surface of the substrate 34 (ESC) by sputtering. The wetting layer 54 (tin) is applied to a backside surface of the substrate 50
20 (aluminum) by ultrasonic wetting. Ultrasonic wetting means that a thin layer of molten tin is spread uniformly over the surface of the substrate 50 using a tool that delivers ultrasonic energy while the molten tin is being spread. The wetting layer 54 can also be applied by sputtering or plating.

After the wetting layer 54 has solidified, the debonding layer 46 is applied on top
25 of the wetting layer 54 by heating the substrate 50 to a temperature above the melting

point of tin (approximately 232°C). Molten tin is then spread over the wetting layer 54 to form a thin layer of tin, preferably having a thickness of approximately 0.001 inches (0.254 mm). Excess tin is removed by wiping the excess molten tin away. Alternatively, excess tin that has solidified may be removed by machining the excess tin away.

5 After the debonding layer 46 has been formed on the substrate 50, the elastomer layer 42 is formed using a procedure that is analogous to the procedure described previously with respect to the elastomer layer 22 in item 10. Specifically, the surfaces of the metallization layer 38 and the debonding layer 46 that will be in contact with the elastomer layer 42 are primed to promote adhesion, such as by coating the surfaces with
10 Dow Corning Primer 1200 or a similar chemical. A piece of copper mesh is also primed, for example by coating the surface of the copper mesh with Dow Corning Primer 1200 or a similar chemical.

 After the recommended wait time for allowing the primer to dry, the Sylgard® 184 is mixed according to the manufacturer's instructions. Aluminum powder filler is
15 added to the elastomer in a ratio of 1:1 by weight of the A component of elastomer (Sylgard® 184). The elastomer/aluminum powder mixture is thoroughly mixed and degassed and the elastomer mixture is applied uniformly to the surfaces of the metallization layer 38 and the debonding layer 46.

 The piece of primed copper mesh is then placed on the elastomer that is covering
20 the debonding layer 46. The substrate 34 is placed on the substrate 50 with the elastomer coated on the metallization layer 38 being brought into contact with the elastomer coated on the debonding layer 46. Pressure is applied to the substrate 34 to hold the item 30 together while the elastomer cures, such as by applying four pounds per square inch (PSI) on the substrate 34, either by weight or clamping. Heat is then applied to the item 10 to
25 cure the elastomer. After the elastomer has cured, the pressure is removed and the

elastomer bond is sufficiently strong to hold the item 30 together without the use of other attachment means, such as mechanical fasteners.

In one embodiment, the present invention is an item (such as the item 30) comprised of a first substrate (such as the substrate 34); a metallization layer (such as the metallization layer 38) adhered to a surface of the first substrate; an elastomer layer (such as the elastomer layer 42) positioned adjacent to the metallization layer; a second substrate (such as the substrate 50); and a debonding layer (such as the debonding layer 46) positioned between the elastomer layer and the second substrate. The debonding layer is comprised of a material that melts at a temperature that will not result in damage to the first substrate and/or the second substrate. The first substrate and the second substrate are held together by the elastomer layer and the debonding layer without the use of other attachment means, such as mechanical fasteners. Preferred types of elastomers that can be used in the elastomer layer include silicone elastomers and poly(dimethylsiloxane) elastomers. Other types of elastomers that can be used in the elastomer layer are the fluoroelastomers referred to as FKMs and the perfluoroelastomers referred to as FFKMs.

In another embodiment, the item 30 can comprise the components listed in the paragraph above and also include a wetting or metallization layer, such as the layer 54, positioned between the second substrate and the debonding layer. In another embodiment, the item 30 can comprise the components listed in the paragraph above but without the metallization layer 38. Such an embodiment could also include the wetting layer 54. The metallization layer 38 could be deleted in cases where the substrate 34 and the elastomer layer 42 form an acceptable bond to each other.

A method for using the invention described above comprises debonding an item (such as the item 30) by heating the item comprised of a first substrate (such as the substrate 34); a metallization layer (such as the metallization layer 38) adhered to a surface

of the first substrate; an elastomer layer (such as the elastomer layer 42) positioned adjacent to the metallization layer; a second substrate (such as the substrate 50); and a debonding layer (such as the debonding layer 46) positioned between the elastomer layer and the second substrate until the debonding layer softens; and then separating the first
5 substrate from the second substrate.

Preferably, the separation occurs at the site of the debonding layer, although it doesn't matter whether the debonding layer separates from the elastomer layer 42 or from the second substrate. Also, preferably, the temperature to which the item is heated to cause debonding is less than 250°C, and more preferably is less than or equal to 232°C.
10 Generally, the item is heated to the melting point of the debonding layer to cause the first and second substrates to become separated. However, the first and second substrates can be separated whenever the debonding layer softens sufficiently, even if this is a few degrees (e.g. 1-3°C) lower than the melting point. Preferably, the debonding layer comprises a solder material selected from the group consisting of indium, tin, bismuth and
15 alloys of indium, tin or bismuth. Pure bismuth has a melting point of approximately 271°C which is slightly above the preferred maximum of 250°C. However, in some situations, such as where the slightly higher temperature will not damage the first substrate and/or the second substrate, a material that melts slightly above 250°C (e.g. bismuth) can be used as the debonding layer. Furthermore, alloys of bismuth melt at temperatures
20 lower than 250°C.

Although the present invention has been described in terms of the presently preferred embodiments, it is to be understood that such disclosure is not to be interpreted as limiting. Accordingly, it is intended that the appended claims be interpreted as covering all alterations and modifications as fall within the true scope of
25 the invention.

CLAIMS

We claim:

1. An apparatus comprising:

5 a first substrate;
 a metallization layer adhered to a surface of the first substrate;
 a second substrate; and
 an elastomer layer positioned between the metallization layer and the second
substrate, with the elastomer layer being sufficiently strong to hold the first substrate and
10 the second substrate together without the need for additional attachment means to hold the
first substrate and the second substrate together.

2. The apparatus of claim 1 wherein the first substrate comprises gold.

15 3. The apparatus of claim 1 wherein the metallization layer comprises titanium.

4. The apparatus of claim 1 wherein the elastomer layer comprises a PDMS
elastomer.

20 5. The apparatus of claim 1 wherein the first substrate comprises a sputtering
target comprised of gold, the metallization layer comprises titanium and aluminum, and
the elastomer layer comprises a PDMS elastomer.

6. An apparatus comprising:

25 a first substrate;

a metallization layer adhered to a surface of the first substrate;

a second substrate;

an elastomer layer positioned adjacent to the metallization layer, with the elastomer layer being sufficiently strong to hold the first substrate and the second substrate together without the need for additional attachment means to hold the first substrate and the second substrate together; and

a debonding layer positioned between the elastomer layer and the second substrate, with the debonding layer melting at a temperature that will not result in damage to the first substrate.

10

7. The apparatus of claim 6 wherein the debonding layer comprises a material that melts in the temperature range of 75 to 250 °C.

8. The apparatus of claim 6 wherein the debonding layer comprises a material selected from the group consisting of indium, tin, bismuth and alloys of indium, tin or bismuth.

15

9. The apparatus of claim 6 wherein the elastomer layer comprises a PDMS elastomer.

20

10. The apparatus of claim 6 wherein the first substrate comprises a ceramic material.

11. The apparatus of claim 6 wherein the metalliazation layer comprises titanium.

25

12. The apparatus of claim 6 further comprising a wetting layer positioned between the debonding layer and the second substrate for helping the debonding layer adhere to the second substrate.

5 13. A method for separating a first substrate from a second substrate comprising:
heating an item comprised of a first substrate, a metallization layer adhered to a surface of the first substrate, an elastomer layer positioned adjacent to the metallization layer, a second substrate and a debonding layer positioned between the elastomer layer and the second substrate until the debonding layer softens; and
10 separating the second substrate from the first substrate.

14. The method of claim 13 wherein the debonding layer has a melting point in the range of 75 to 250 °C.

15 15. The method of claim 14 wherein the item is heated to the melting point of the debonding layer.

16. The method of claim 13 wherein the debonding layer comprises a solder material selected from the group consisting of indium, tin, bismuth and alloys of indium,
20 tin or bismuth.

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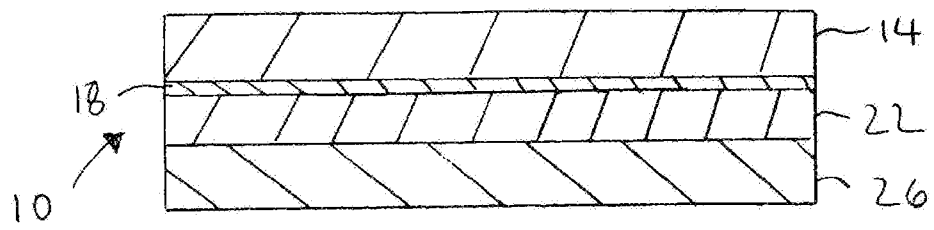


Fig. 1

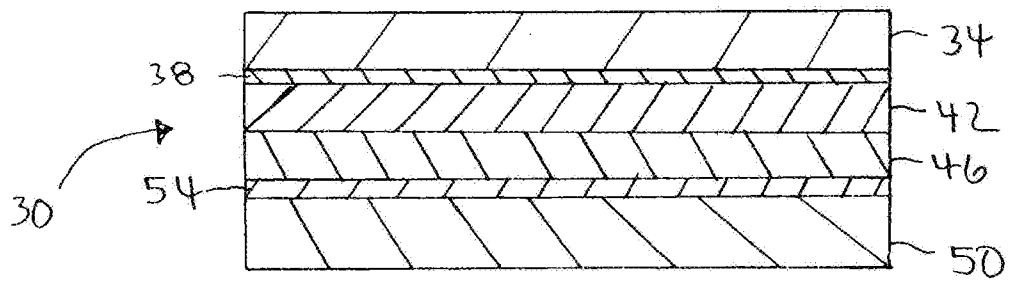


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/36973

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - C23C 14/00 (2012.01)

USPC - 204/298.12; 204/192.12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8)- C23C 14/00 (2012.01);

USPC- 204/298.12; 204/192.12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Patents and NPL (classification, keyword; search terms below)

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

PubWest (US Pat, PgPub, EPO, JPO), GoogleScholar (PL, NPL), FreePatentsOnline (US Pat, PgPub, EPO, JPO, WIPO, NPL);

Search terms used: metal, sputter, target, substrate, plate, layer, first, second, PDMS, polydimethylsiloxane, titanium, Ti, aluminum, aluminium, Al, gold, Au

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006/0272941 A1 (SIMPSON et al.) 07 December 2006 (07.12.2006), para [0008], [0022], [0026]-[0032], [0038], [0041], [0042], [0046], [0048]	1, 2, 4
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Y		3, 5
Y	US 6,921,470 B2 (MICHALUK) 26 July 2005 (26.07.2005), col 5, ln 61-col 6, ln 20	3, 5
Y	US 2003/0211665 A1 (BAO et al.) 13 November 2003 (13.11.2003), Fig. 3; para [0011], [0016], [0029]-[0032]	3, 5
Y, P	US 2011/0180906 A1 (WESSELS et al.) 28 July 2011 (28.07.2011), para [0013]-[0120]	1-5
Y	US 2009/0214838 A1 (LUSSEM et al.) 27 August 2009 (27.08.2009), para [0008]-[0082]	1-5
Y	SCHMID et al. "Preparation of Metallic Films on Elastomeric Stamps and Their Application for Contact Processing and Contact Printing." Advanced Functional Materials [online], Epub 14 February 2003 (14.02.2003) [Retrieved on 2012-09-20], Vol. 13, Iss. 2, pp. 145-153, Retrieved from the Internet: <URL: http://onlinelibrary.wiley.com/doi/10.1002/adfm.200390021/abstract >, see entire document, especially Figs. 1-6	1-5
Y	US 2002/0160582 A1 (CHEN et al.) 31 October 2002 (31.10.2002), para [0007]-[0040]	1-5

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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

"&" document member of the same patent family

Date of the actual completion of the international search

20 September 2012 (20.09.2012)

Date of mailing of the international search report

05 OCT 2012

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300

PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/36973

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

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

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

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

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

The following claim groups were found:

Group I: Claims 1-5

Group II: Claims 6-16

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: is drawn to an apparatus comprising: a first substrate; a metallization layer adhered to a surface of the first substrate; a second substrate; and an elastomer layer positioned between the metallization layer and the second substrate, with the elastomer layer being sufficiently strong to hold the first substrate and the second substrate together without the need for additional attachment means to hold the first substrate and the second substrate together.

-- Please see Extra Sheet --

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-5

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

Continued on Box No. III – Observations where unity of invention is lacking:

The following claim groups were found:

Group I: Claims 1-5

Group II: Claims 6-16

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: is drawn to an apparatus comprising: a first substrate; a metallization layer adhered to a surface of the first substrate; a second substrate; and an elastomer layer positioned between the metallization layer and the second substrate, with the elastomer layer being sufficiently strong to hold the first substrate and the second substrate together without the need for additional attachment means to hold the first substrate and the second substrate together.

Group II: is drawn to an apparatus comprising: a first substrate; a metallization layer adhered to a surface of the first substrate; a second substrate; and an elastomer layer positioned between the metallization layer and the second substrate, with the elastomer layer being sufficiently strong to hold the first substrate and the second substrate together without the need for additional attachment means to hold the first substrate and the second substrate together; and a debonding layer positioned between the elastomer layer and the second substrate, with the debonding layer melting at a temperature that will not result in damage to the first substrate.

The inventions listed in the above-mentioned groups do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

Groups I-II lack unity of invention, because even though the inventions of these groups require the technical features of a first substrate; a metallization layer adhered to a surface of the first substrate; a second substrate; and an elastomer layer positioned between the metallization layer and the second substrate, with the elastomer layer being sufficiently strong to hold the first substrate and the second substrate together without the need for additional attachment means to hold the first substrate and the second substrate together, these technical features are not special technical features as they do not make a contribution over the prior art in view of US 2006/0272941 A1 to Simpson et al., which discloses a first substrate (para [0046], sputtering target); a metallization layer adhered to a surface of the first substrate (para [0046], metal foil placed on mating surface of sputtering target); a second substrate (para [0046], [0048], backing plate); and an elastomer layer positioned between the metallization layer and the second substrate (para [0048], [0041]), with the elastomer layer being sufficiently strong to hold the first substrate and the second substrate together without the need for additional attachment means to hold the first substrate and the second substrate together (para [0038], [0041], allowing the elastomer to form an elastomer bond that holds the sputtering target to the backing plate, no additional attachment means specified).

Groups I-II therefore lack unity under PCT Rule 13 because they do not share a same or corresponding special technical feature.