

SYSTEM AND METHOD FOR SINTERING STRUCTURES ON A BASE

FIELD OF INVENTION

- 5 The invention generally relates to the fabrication of electronic components. More specifically, a system and method for sintering one or more structures on a base. The structures may be copper pillars and the base may be a substrate such as a wafer.

BACKGROUND OF THE INVENTION

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In the semiconductor industry, copper pillars are fabricated on contacts of an electronic component, such as chips, to provide electrically conductive paths between the electronic component and other components or circuitry. Fabrication of copper pillars conventionally involve electrolytic or electroless plating, which have an inherent
15 problem wherein these plating processes are unable to build up one or more plated copper pillars without any void.

Additionally, these conventional plating processes may not result in copper pillars that are to be fully solid, and these loosely-plated copper pillars may cause the electronic
20 component to have poor performance.

There are a few disclosed technologies over the prior art relating to the fabrication of copper pillars and their sintering. Among them include the United States Patent Application US2021313197A1. This prior art discloses a system and method for
25 manufacturing conductive pillars using a conductive paste. The conductive paste is applied onto a mask, in the form of a resin film that is formed on a substrate, wherein the resin film comprises a plurality of openings. The conductive paste is made to enter the openings of the resin film to form the conductive pillars. Then, the remaining conductive paste is removed from the surface of the resin film. Subsequently, a sintering
30 process is conducted in a hot environment for conductive pillars to be sintered.

It is to be noted that the teachings of the prior art may have certain weaknesses. In particular, for prior art US2021313197A1, its sintering process is done as the mask(i.e. the resin film) remains on the substrate. As such, the sintered conductive pillars may join to the mask, and as the mask is removed, a certain amount of the sintered
5 conductive material may be removed together with the mask, and the sintered conductive pillars may have a volume that is less than desired. Furthermore, the sintering process may not enable particles of the conductive pillars to be sufficiently sintered as it lacks a force-providing means that enables particles of the conductive pillars to be necked in an even more compact manner.

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Evidently, the teachings taught by the aforementioned prior art may not properly enable fabricated copper pillars to be appropriately sintered in a desired manner. Accordingly, it is desirable to have a system and a method that does so.

15 SUMMARY OF INVENTION

The main objective of the invention is to provide a system and a corresponding method for sintering one or more structures on a base. To achieve this objective, the system and the corresponding method comprise a sinter unit that applies force and provides heat to
20 the structures on the base for the structures to sinter, in which a plate is made to be adjacent to the structures on the base. The structures that are sintered may be of electrically conductive material such as copper, and the base may be a substrate such as a wafer.

25 Advantageously, the present invention eliminates substrate-level structure formation-related processes such as wafer-level copper pillar formation processes, thereby enabling cycle time improvement in the production process with the benefit of capital expenditure avoidance. Advantageously as well, the present invention may provide a more cost-effective alternative for forming copper pillars on wafers compared to
30 existing techniques that form copper pillars on components.

The present invention intends to provide a system for sintering one or more structures on a base, comprising at least one sinter unit, configured to sinter the structures on the base, wherein the sinter unit is further configured to apply force and provide heat to the
5 structures on the base for the structures to sinter, in which a plate is made to be adjacent to the structures on the base.

Preferably, the sinter unit comprises a thermal-pressure module, which comprises a presser, which is configured to apply the force via its press surface, which is further
10 attached with the plate, a platform, in which the base rests thereupon, and a heating sub-module, which is configured to provide heat to any one or both the presser and the platform.

Preferably, the presser, which is attached with the plate, is configured to move along
15 one or more directions, which includes a first direction for applying the force against the structures on the base, with the plate being between the presser and the structures on the base.

Preferably, the presser, which is attached with the plate, is configured to move along a
20 second direction for relieving the force against the structures on the base while leaving the plate on the structures of the base.

Preferably, the system further comprises a plate handler module that is configured to prepare and handle the plate for the plate to be attached onto the presser, the plate to be
25 removed from being rested on the structures of the base, or a combination thereof.

Preferably, the plate has at least one coated layer on at least one of its surfaces for it to adhere to the presser.

Preferably, the system further comprises a first material application unit configured to position a stencil to be adjacent to the base, and dispose or deposit a first material onto the stencil to be spread, for the structures to be formed on the base.

- 5 Preferably, the system further comprises a second material application unit configured to dispose or deposit second material onto the structures on the base.

Preferably, the structures are of a material composition that is selected from a group of metals that comprise, but are not limited to, copper, silver, gold, palladium, tin, or
10 platinum.

The present invention further intends to provide a method for sintering one or more structures on a base, comprising the step of sintering the structures on the base, by a sinter unit. The sinter unit is further configured to apply force and provide heat to the
15 structures on the base for the structures to sinter, in which a plate is made to be adjacent to the structures on the base.

One skilled in the art will readily appreciate that the invention is well adapted to carry out the objects and obtain the ends and advantages mentioned, as well as those inherent
20 therein. The embodiments described herein are not intended as limitations on the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

- 25 To facilitate an understanding of the invention, there are illustrated in the accompanying drawings the preferred embodiments from an inspection of which when considered in connection with the following description, the invention, its construction and operation and many of its advantages would be readily understood and appreciated.

- FIG. 1** is a schematic diagram illustrating an example system of the present invention for sintering structures on a base.
- FIG. 2** is a flowchart illustrating example steps of the method of the present invention for sintering structures on a base.
- FIG. 3** is a schematic diagram illustrating the base being applied with a first material, which may be electrically-conductive material, thereupon for forming the first structures on the base, according to an example implementation of the present invention.
- FIG. 4** is a schematic diagram illustrating the base having first structures formed thereupon, according to an example embodiment of the present invention.
- FIG. 5** is a schematic diagram illustrating the base having the first structures thereon, undergoing drying by a heating module for the first structures to sinter, according to an example implementation of the present invention.
- FIG. 6** is a schematic diagram illustrating the base having second structures thereupon, which are sintered from the first structures, according to an example embodiment of the present invention.
- FIG. 7** is a schematic diagram illustrating the base having second structures thereupon, which is to receive a pressure force exerted by a heated presser, with a plate being in-between the presser and the second structures, according to an example implementation of the present invention.

FIG. 8 is a schematic diagram illustrating the base having second structures thereupon, in which the plate remains rested on the second structures after the pressure force is relieved, according to an example implementation of the present invention.

FIG. 9 is a schematic diagram illustrating the base having second structures thereupon, in which the plate is removed.

FIG. 10 is a schematic diagram illustrating the base having third structures thereupon, which are sintered from the second structures, according to an example embodiment of the present invention.

FIG. 11 is a schematic diagram illustrating the base having the third structures, each having the second material, being cleaned by one or more cleaners, according to an example implementation of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention primarily relates to a system and method for sintering one or more structures on a base. The structures that are sintered may be electrically conductive. More specifically, the structures may be copper pillars.

From hereon, in the context of the present invention, it is to be stated that the term “base” may refer to an item that is to be used as (i) a base layer in which at least one electronic component or electronic circuit is fabricated therefrom, (ii) a base layer that supports at least one electrical and/or electronic component attached thereto, (iii) contact pads of an electronic component that may be a die or a chip, (iv) contact pads of a circuit board, or (v) a combination thereof. The base may broadly also be any form of item that is capable of providing support. It is preferred that the base may be in the

form of a substrate, such as a wafer. Furthermore, the base may be electrically conductive, electrically semi-conductive or an electrical insulator. The composition of the base may be of a single element, a compound, an alloy, or a composite. By way of example, the composition of the base may be of silicon, germanium, FR-4, or the like.

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The invention will now be described in greater detail, by way of example, with reference to the drawings.

FIG. 1 is a schematic diagram illustrating an example system of the present invention for sintering structures on a base. As shown in **FIG. 1**, a base **10** is to be provided to the system of the present invention for structures to be formed and sintered thereon.

The system of the present invention may comprise at least one first material application unit **30**, at least one first sinter unit **40**, at least one second sinter unit **50**, at least one second material application unit **60**, and at least one cleaning unit **70**. It is to be noted that the second material application unit **60**, and the cleaning unit **70** may be optionally included in the aforementioned system.

These aforementioned units may be substantially in communication with each other via wired or wireless means. These aforementioned units may also be substantially connected with each other via one or more conveying units which may carry objects (i.e. the base **10** having structures or without structures) from one unit to another. Furthermore, the aforementioned units may be located at different locations, or alternatively, they may be housed within a single machine.

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As shown in **FIG. 1**, the base **10** is to be provided to the first material application unit **30** for one or more first structures **21** to be formed thereon. Then, the base **10**, having the first structures **21** thereon, may be provided to the first sinter unit **40** for the first structures **21** to be sintered into second structures **22**. Then, the base **10**, having the second structures **22** thereon, may then be provided to the second sinter unit **50** for the

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second structures **22** to be sintered into the third structures **23**.

The base **10** having the third structures **23** may then optionally be provided to a second material application unit **60**, and subsequently, a cleaning unit **70**. With this, the base
5 **10** shall have its third structures **23** disposed or deposited with a second material **61** while being cleaned accordingly for subsequent downstream processing.

Regarding the first material application unit **30** as shown in **FIG. 1**, it may generally comprise at least one stencil **31**, at least one squeegee **32**, and at least one first material
10 supply **33** that supplies first material. In particular, the first material supplied by the first material supply **33** is to be disposed or deposited onto the base **10** and be spread across a stencil **31** through the squeegee **32** for filling apertures of the stencil **31**. The squeegee **32** may apply a force to ensure that the apertures of the stencil **31** are each compactly filled with the first material. With that, the base **10** may be formed with the
15 first structures **21**. It is to be noted that stencil **31** may be made from metallic material, or any other suitable material.

Regarding the first material application unit **30**, in one embodiment where the base **10** has one or more contact pads, the stencil **31** may be positioned for its apertures to be
20 aligned with these contact pads so that the first material to be disposed or deposited thereon for the first structures **21** to be formed upon each contact pad.

Whilst not shown in **FIG. 1**, the first material application unit **30** may generally further comprise at least one manipulator module and at least one processor. In particular, the
25 manipulator may manipulate any one or a combination of the substrate **10**, the stencil **31**, the squeegee **32** and the first material supply **33** for their intended operations. Whereas, the processor may run at least one software application to operate one or more software modules that execute instructions related to the operation of the first material application unit **30**, and it may be substantively interfaced with any one or a
30 combination of the manipulator and the first material supply **33**.

Regarding the first sinter unit **40** as shown in **FIG. 1**, it may generally comprise a heating module **41** that is configured to heat an enclosed environment. Whilst not shown in **FIG. 1**, the first sinter unit **40** may generally further comprise an accessible enclosure, which may define the enclosed environment especially when it is in a closed condition. The heating module **41** may further be configured to provide heat to the enclosure either by means of conduction, convection, radiation, or any combination thereof. Also, the heating module **41** may further be configured to substantially enable the enclosure to be evenly heated to a preset temperature.

Regarding the second sinter unit **50** as shown in **FIG. 1**, it may generally be configured to sinter the second structures **22** on the base **10** into the third structures **23**. In particular, it may be further configured to apply force and provide heat to the structures (i.e. the second structures **22**) on the base **10** for them to sinter, in which a plate **521** is made to be adjacent to the structures on the base **10**.

Regarding the second sinter unit **50** as shown in **FIG. 1**, it may generally comprise a thermal-pressure module **51** and a plate handler module **52**. In particular, the thermal-pressure module is configured to provide heat while exerting a force, in the form of a pressure force, to an object (i.e. the base **10** having the second structures **22**) that is provided to the second sinter unit **50**. Whereas, the plate handler module **52** is to handle a plate that is to be used as an intermediary layer between the aforementioned object and the thermal-pressure module **51**.

Regarding the thermal-pressure module **51** as shown in **FIG. 1**, it may generally comprise a presser **511**, a platform **512**, and a heating sub-module **513**. In particular, the presser **511** is configured to apply the pressure force via its press surface, the platform is where the object (i.e. the base **10** having the second structures **22**) rests thereupon, and the heating sub-module **513** is configured to provide heat to any one or both the presser **511** and the platform **512**.

In particular, regarding the presser **511**, it may be configured to move along one or more directions. These directions may include any one or both a first direction and a second direction. As the presser **511**, attached with the plate, moves along the first direction, it
 5 applies the pressure force against the structures on the base **10**, with the plate being between the presser **511** and the second structures **22** on the base **10**. As the presser **511**, attached with the plate, moves along the second direction, it relieves the pressure force applied against the second structures **22** on the base **10**.

10 In particular, regarding the presser **511**, it is to be noted that its press surface may be substantially smooth for it to be attached to the plate. The shall ensure a maximum transfer of pressure force and heat energy by the presser **511** to the plate attached thereto, for the pressure force and heat energy to be received by the second structures **22** on the base **10** with minimal losses.

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In particular, regarding the heating sub-module **513**, it may further be configured to substantially heat either one or both the presser **511** and the platform **512** evenly or unevenly to a preset temperature. Also, the heating sub-module **513** may heat the presser **511** and the platform **512** for them to have a different temperature, or a
 20 temperature of the same.

Regarding the plate handler module **52** as shown in **FIG. 1**, it preferably facilitates the handling of a plate that is to be attached onto the press surface of the presser **511**. This is so that the plate may be the presser **511** and the object (i.e. the base **10** having the
 25 second structures **22**) resting on the platform **512**, in which the plate is adjacent to the second structures **22** of the base **10**. Whilst not shown, the plate handler module **52** may comprise its own manipulator module for preparing and handling the plate for it to be attached to or detached from the presser **511**.

Regarding the plate handler module **52**, it is to be noted that the characteristics of the plate may include that it is substantially rigid and heat resistant. As such, when the heated presser **511**, which is attached with the plate, exerts a pressure force towards the object (i.e. the base **10** having the second structures **22**) on the platform **512**, the plate
5 may substantially maintain its shape while providing the pressure force and the transfer of heat to the second structures **22**. The plate may also have a thickness that shall enable it to withstand the pressure exerted by the presser **511** without undergoing bending or breaking. With this, the plate may be made of material that may be, but shall not be limited to, ceramics, glass, borosilicate glass, polycarbonates, or the like. Moreover, the
10 thickness of the plate may be substantially between 700 μm – 900 μm , but most preferably 800 μm , hence, the plate may be wafer-like.

Regarding the plate handler module **52**, it is to be noted it may have a coating means, device, or unit, for at least one or both surfaces of the plate to have a coated layer. This
15 may allow the plate to substantially adhere to the press surface of the presser **511** for it to be attached thereon.

In particular, the adhesiveness of the coated layer may be any one or both temperature-dependent and pressure-dependent. Furthermore, it is to be noted that the plate may be
20 pre-coated with the coated layer prior to the second sinter unit **50** receiving an object (i.e. the base **10** having the second structures **22**).

It is to be noted that, in one embodiment of the present invention, the plate that is attached onto the presser **511** may detach therefrom, upon the presser **511** having a
25 preset temperature. In yet another embodiment of the present invention, the plate that is attached onto the presser **511** may detach therefrom, upon the presser **511** exerting a preset pressure force upon the object (i.e. the base **10** having the second structures **20**) on the platform **512**. In yet another embodiment of the present invention, the plate that is attached onto the presser **511** may detach therefrom, upon the presser **511** having a

preset temperature and exerting a preset pressure force upon the object (i.e. the base **10** having the second structures **20**) on the platform **512**.

It is to be noted that, as the heated press **511**, which is attached with the plate, exerts a pressure force and provides heat to the object (i.e. the second structures **22** on the base **10**) on the platform **512**, with the plate being therebetween them, these second structures **22** may undergo sintering and may substantially stick to either one or both the plate and the base **10**, instead of the presser **511**.

Whilst not shown, the second sinter unit **50** may further comprise a processor that may run at least one software application to operate one or more software modules that execute instructions related to the operation of the second sinter unit **50**, and it may be substantively interfaced with, or allows interfacing of, any one or a combination of the thermal-pressure module **51** and the plate handler module **52**, and their related components.

Regarding the second material application unit **60** as shown in **FIG. 1**, it is configured to dispose or deposit second material upon an object (i.e. the third structures **23** of the base **10**) that is provided thereto. Whilst not shown, it may substantially comprise components similar to the first material application unit **30**. By way of example, it may generally comprise a second material disposition means, a second material supply, and a corresponding processor that operates software modules for its intended operations.

Regarding the cleaning unit **70** as shown in **FIG. 1**, it is configured to perform cleaning upon at least one object (i.e. the base **10** having the third structures **22** each disposed or deposited with a second material) that is provided thereto. The cleaning unit **70** may generally comprise one or more cleaners **71** for cleaning the entirety of the object. The cleaning performed by these cleaners **71** may be any type of cleaning known in the art of cleaning semiconductor components during their manufacturing.

With this, it is to be noted that the first material that is applied by the first material application unit **30** onto the base **10** is preferably electrically conductive. The composition of the first material may be of a single element, and it may most preferably
 5 be copper, but it may be any other element selected from a group of elements that comprise aluminium, silver, gold, palladium, tin, platinum, or the like, and it should be noted that they may not be limited to as such. Alternatively, the first material may have a composition that of an alloy, a compound, or a composite.

10 In the case where the first material has a material composition that is copper, the first structures may be regarded as first copper pillar precursors, the second structures may be regarded as second copper pillar precursors, and the third structures may be regarded as the final product being copper pillars.

15 With this, it is to be noted that the second material that is applied by the second material application unit **60** onto the third structures **23** on the base **10** may be bonding material having adhesive properties. More specifically, the second material shall substantially promote bonding between third structures **23** on the base **10** and other components or objects. The second material may be bonding agents such as solder, or the like.

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As for processors that may be present in each of the units of the system of the present invention, they may be, but shall not be limited to, a conventional processor, application-specific integrated circuit (ASIC), a field-programmable gate array (FPGA), a graphics processing unit (GPU), or a combination thereof.

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It is noted that for the rest of the description, the described hardware and software components of the system may not be directly implicated. However, it is to be understood by a skilled person that the descriptions of the hardware and software components above provide support for the rest of the description.

FIG. 2 illustrates an example flowchart describing the method for sintering structures on a base as provided by the present invention. It is noted that the steps described in this flowchart are not to be interpreted as non-limiting, and minor modifications to the steps (e.g. additions, repetitions, omissions, or swaps) are permissible by a skilled person without substantial deviation from as described.

Furthermore, it is to be noted that the descriptions relating to **FIG. 2** shall be further complemented by **FIGS 3 – 11**, and they may further complement the system of the present invention as described in **FIG. 1**.

FIG. 2 may begin with step **201**. Step **201** may involve providing at least one of the base **10** to the first material application unit **30**. In particular, the base **10** had been prepared accordingly for it to be formed with structures. By way of example, base **10** may be a disc of silicon wafer, a piece of silicon die singulated from a silicon wafer, or the like.

Steps **202** to **205** may be subsequent steps of Step **201**. Steps **202** to **205** shall be described in relation to **FIGS 2** and **3**. More specifically, these steps may relate to operations performed by the first material application unit **30**.

In particular, following step **201** may be step **202**. Step **202** may involve actuating a stencil **31**, having one or more apertures **311**, to be adjacent to the base **10**.

In particular, following step **202** may be step **203**. Step **203** may involve disposing or depositing first material **20** onto the stencil **30**. In particular, the first material **20** may be supplied and deposited by the first material supply **33**.

In particular, following step **203** may be step **204**. Step **204** may involve actuating a squeegee **32** to spread the first material **20** across the stencil **10**. While doing so,

apertures **311** of the stencil **31** may be filled.

In particular, following step **204** may be step **205**. Step **205** may involve actuating the stencil **31** to be lifted away from the base **10**.

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With this, as per step **206** and as shown in **FIG. 4**, the base **10** shall now be formed with one or more first structures **21** thereon. These first structures **21** may be pillar-like formations on the base **10**, wherein the first structures **21** may each have a volume that may correspond to a volume of the apertures **311** of the stencil **31**.

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Following step **206** may be step **207**. Step **207** may involve providing the base **10**, which has the first structures **21** thereon, to the first sinter unit **40**.

Following step **207** may be step **208**. Step **208** shall be described in relation to **FIGS 2**
15 and **5**. More specifically, step **208** may relate to operations performed by the first sinter unit **40**. In particular, step **208** may involve heating the first structures **21** that are on the base **10** for them to dry or sinter, by a heating module **41**. In particular, the heating module **41** shall heat the surroundings of the first structures **21**.

20 With this, as per step **209** and as shown in **FIG. 6**, the base **10** shall now have one or more second structures **22** thereon, which are transformed from, or sintered from, the first structures **21**. In particular, these second structures **22** may have shrunk, and each of them may have an overall volume that may be lesser than previous when each of them was in the form of the first structures **21**, due to their particles becoming fused
25 after being provided to the first sinter unit **40**.

Following step **209** may be step **210**. Step **210** may involve providing the base **10**, which has the second structures **22** thereon, to the second sinter unit **50**.

30 Steps **211** to **217** may be subsequent steps of Step **210**. Steps **211** to **217** shall be described in relation to **FIGS 2, 7, 8** and **9**. More specifically, these steps may relate to

operations performed by the second sinter unit **50**.

In particular, following step **210** may be step **211**. Step **211** may involve actuating a plate handler module **52** to attach a plate **521** onto a surface of a presser **511** of a
5 thermal-pressure module **51**.

In particular, following step **211** may be step **212**. Step **212** may involve positioning the base **10** for its second structures **22** to be in the proximity or vicinity of the plate **521** that is attached onto the press **511**.
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In particular, following step **212** may be step **213**. Step **213** may involve actuating the presser **511**, having the plate **521** attached thereon, to move in a first direction for it to apply a pressure force against the second structures **22** on the base **10** with the plate **521** being therebetween them. This may be as shown in **FIG. 7**.
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In particular, following step **213** may be step **214**. Step **214** may involve heating any one or both (i) the presser **511**, having the plate **521** attached thereonto, and (ii) the platform **512**, to a preset temperature.

20 In particular, following step **214** may be step **215**. Step **215** may involve maintaining the pressure force applied by the presser **511** for a preset duration for the second structures **22** on the base **10** to sinter.

In particular, following step **215** may be step **216**. Step **216** may involve actuating the
25 presser **511** to move in a second direction for it to relieve the pressure force applied against the plate **521**, as well as the second structures **22** on the base **10**. In particular, as the presser **511** moves in the second direction, the plate **521** is detached from the press surface of presser **511**, and shall rest on the second structures **22** on the base **10**. This may be as shown in **FIG. 8**. The plate **521** may remain rested thereon for preset

duration.

In particular, following step **216** may be step **217**. Step **217** may involve actuating the plate handler module **51** to remove the plate **521** from the second structures **22** on the base **10**. This may be as shown in **FIG. 9**. With this, the plate **521** may either be disposed of, or be reused for a subsequent object that is provided to the second sinter unit **50** in which it may be cleaned and a layer of coating may be applied thereto for its reattachment to the presser **511**.

It is to be noted that, in relation to steps **211** to **217**, the plate **521** shall prevent the second structures **22** from adhering with the presser **511**. As such, the overall shape of the second structures **22** may be substantially maintained or preserved during or after being pressed by the presser **511**. Furthermore, the plate **521** may also substantially allow second structures **22** to sinter and join or co-join the base **10**, or more specifically, designated locations on the base **10** (e.g. contact pads, etc.), if any.

It is to be noted that, in relation to steps **211** to **217**, since the plate **521** is between the presser **511** and the second structures **22** on the base **10**, as the presser **511** disengages from the second structures **22**, particle adhesion of the second structures **22** to the presser **511** is avoided. As the plate **521** enables the second structures **22** to receive the pressure force exerted by the presser **511**, it may also insulate a certain amount of heat transferred from the presser **511** to the second structures **22**, thereby avoiding adhesion of upper portions of the second structures **22** onto the plate **521** or the presser **511** during sinter pressing. Hence, no bits/pieces of the second structures **22** will be stuck onto the presser **511**, thereby maintaining the overall shape of the second structures **22**.

With this, as per step **218** and as shown in **FIG. 10**, the base **10** shall now have one or more third structures **23** thereon, which are transformed from, or sintered from, the second structures **22**. In particular, these third structures **23** may have further shrunk, and each of them may have an overall volume that may be lesser than when they were

in the form of the second structures **22**. This is due to the second sinter unit **50** further causing the particles of these structures to fuse and become compacted.

Following step **218** may be step **219**. Step **219** may involve providing the base **10**,
5 having the third structures **23**, to a second material application unit **60** for its third structures **23** to each be disposed or deposited with second material **61** thereupon.

Finally, following step **219** may be step **220**. Step **220** shall be described in relation to
10 **FIGS 2 and 9**. More specifically, step **220** may involve providing the base **10**, having the third structures **23**, each with the second material **61** thereupon, to a cleaning unit **70**, for them to be cleaned by one or more cleaners **71**.

In relation to the system described as per **FIG. 1**, the steps described as per **FIG. 2**, and the other figures **FIGS 3 – 11**, it may be stated that the two or more sinter units (first
15 sinter unit **40** and the second sinter unit **50**) consecutively sinters the structures on the base **10** for them to eventually have a desired structural integrity in the form of third structures **23**.

With this, a system and method for sintering structures on a base have been described.
20 While it has been described that the invention is generally applicable to items or objects related to the semiconductor fabrication such as fabrication of copper pillars, it is to be noted that the application of the invention may further be generally applicable for other applications that involve sintering structures on a base.

25 The present disclosure includes as contained in the appended claims, as well as that of the foregoing description. Although this invention has been described in its preferred form, it is understood that the present disclosure of the preferred form has been made only by way of example and numerous changes in the details of the construction, combination and arrangements of parts may be resorted to without departing from the
30 scope of the invention.

CLAIMS

1. A system for sintering one or more structures on a base (10), comprising
at least one sinter unit (50), configured to sinter the structures on the base (10);
5 wherein the sinter unit (50) is further configured to
apply force and provide heat to the structures on the base (10) for the structures
to sinter, in which a plate (521) is made to be adjacent to the structures on the base (10).
2. The system according to claim 1, wherein the sinter unit (50) comprises a
10 thermal-pressure module (51), which comprises
a presser (511), which is configured to apply the force via its press surface,
which is further attached with the plate (521);
a platform (512), in which the base (10) rests thereupon; and
a heating sub-module (513), which is configured to provide heat to any one or
15 both the presser (511) and the platform (512).
3. The system according to claim 2, wherein the presser (511), which is attached
with the plate (521), is configured to move along one or more directions, which includes
a first direction for applying the force against the structures on the base (10), with the
20 plate (521) being between the presser (511) and the structures on the base (10).
4. The system according to claim 3, wherein the presser (511), which is attached
with the plate (521), is configured to move along a second direction for relieving the
force against the structures on the base (10) while leaving the plate (521) on the
25 structures of the base (10).
5. The system according to claim 4, further comprising a plate handler module (52)
that is configured to prepare and handle the plate (521) for
the plate (521) to be attached onto the presser (511);
30 the plate (521) to be removed from being rested on the structures of the base

(10);

or a combination thereof.

6. The system according to any one of the preceding claims, wherein the plate
5 (521) has at least one coated layer on at least one of its surfaces for it to adhere to the presser (511).

7. The system according to any one of the preceding claims, further comprising a
first material application unit (30) configured to position a stencil (31) to be adjacent to
10 the base (10), and dispose a first material (20) onto the stencil (30) to be spread, for the structures to be formed on the base (10).

8. The system according to any one of the preceding claims, further comprising a
second material application unit (60) configured to dispose second material (61) onto
15 the structures on the base (10).

9. The system according to any one of the preceding claims, wherein the structures
are of a material composition that is selected from a group of metals that comprises
copper, silver, gold, palladium, tin, or platinum.

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10. A method for sintering one or more structures on a base (10), comprising the
step of sintering the structures on the base (10), by a sinter unit (50);
wherein the sinter unit (50) is further configured to
apply force and provide heat to the structures on the base (10) for the structures
25 to sinter, in which a plate (521) is made to be adjacent to the structures on the base (10).