

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 involves 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 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 comprises a sinter unit that positions at least one film layer
20 to be in proximity to the structures on the base, and applies force and provides heat to the film layer and the structures on the base for the structures to sinter. 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. The sinter unit is further configured to position at least one film layer to be in
5 proximity to the structures on the base, apply force and provide heat to the film layer and the structures on the base for the structures to sinter.

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

Preferably, the presser is configured to move along one or more directions, which include any one or both a first direction for applying the force against the structures on
15 the base, with the film layer being between the presser and the structures on the base, and a second direction for relieving the force against the structures on the base.

Preferably, the press surface of the presser is contoured to include one or more cavities, which are each to substantially enclose and be substantially adjacent to each structure
20 on the base as the presser applies the force.

Preferably, the film layer is heat resistant, and the presser has a coating that substantially prevents adhesion between the presser and any one or both the film layer and the
25 structures on the base.

Preferably, the system further comprises a film handler module that is configured to prepare and handle a tray, the tray being formed by the film layer being supported by a support structure, for the tray to be actuated for the film layer to be between the presser and the structures on the base.

Preferably, the system further comprises a first material application unit configured to position a stencil to be adjacent to the base, and dispose a first material onto the stencil to be spread, for the structures to be formed on the base. Preferably as well, the system
5 further comprises a second material application unit configured to dispose or deposit second material onto the structures on the base. Preferably as well, the structures are of a material composition that is selected from a group of metals that comprises copper, silver, gold, palladium, tin, or platinum.

10 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 position at least one film layer to be in proximity to the structures on the base, and apply force and provide heat to the film layer and the structures on the base for the structures to sinter.

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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 therein. The embodiments described herein are not intended as limitations on the scope of the invention.

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BRIEF DESCRIPTION OF THE DRAWINGS

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
25 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.

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- 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, more specifically, 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 film layer 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 third structures thereupon, which are sintered from the second structures, according to

an example embodiment of the present invention.

FIG. 9 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.

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
5 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
10 (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.

As shown in **FIG. 1**, the base **10** is to be provided to the first material application unit
15 **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 second structures **22** to be sintered into the third structures **23**.

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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 **10** shall have its third structures **23** disposed or deposited with a second material **61** while being cleaned accordingly for subsequent downstream processing.

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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 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
30 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 first structures **21**. It is to be noted that stencil **31** may be made from metallic material, or any other suitable material.

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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 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.

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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 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.

15 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 combination of the manipulator and the first material supply **33**.

20 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.

25 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,

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it may be further configured to position at least one film layer to be in proximity to the structures (i.e. the second structures **22**) on the base **10**, and apply force and provide heat to the film layer and the structures (i.e. the second structures **22**) on the base **10** for them to sinter.

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Regarding the second sinter unit **50** as shown in **FIG. 1**, it may generally comprise a thermal-pressure module **51** and a film 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
 10 provided to the second sinter unit **50**. Whereas, the film handler module **52** is to handle a film layer that is to be used as an intermediary between the aforementioned object and the thermal-pressure module **51**.

Regarding the thermal-pressure module **51** as shown in **FIG. 1**, it may generally
 15 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**.

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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** moves along the first direction, it applies the pressure force against the structures on the base **10**, with the film layer being between the presser and
 25 the second structures **22** on the base **10**. As the presser **511** moves along the second direction, it relieves the pressure force applied against the second structures **22** on the base **10**.

In particular, regarding the presser **511**, it is to be noted that its press surface may be

contoured to have one or more cavities. These cavities may be concave-shaped. As the presser **511** applies the pressure force, these cavities may each substantially enclose and be substantially adjacent to a second structure **22** on the base **10** that is resting on the platform **512**. Moreover, as the presser **511** applies the pressure force, these cavities
 5 may each substantially mould a shape of a structure on the object (i.e. the second structures **22** of the base **10**), which rests on the platform **512**, for them to substantially conform to the shape of the cavity.

In particular, regarding the presser **511**, it is to be noted that its press surface may be
 10 coated with a non-stick or anti-stick coating to enable the presser **211** to disengage from the object (i.e. the base **10** having the second structures **22**) resting on the platform **512**, while preventing adhesion between the presser **511**, and any one or both the film layer and the second structures **22** on the base **10**.

15 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 temperature of the same.

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Regarding the film handler module **52** as shown in **FIG. 1**, it preferably facilitates the handling of a film layer that is to be positioned between the presser **511** and the object (i.e. the base **10** having the second structures **22**) resting on the platform **512**, with the film layer being proximity with the second structures **22** of the base **10**. Whilst not
 25 shown, the film handler module **52** may comprise its own manipulator module for preparing and handling a tray having the film layer. The aforementioned tray may comprise a substantially frame-like or annular-like support structure having an inner perimeter and an outer perimeter.

Regarding the film handler module **52**, it is to be noted that the film layer may be manipulated to be overlaid across the support structure for it to be substantially defined with an outer portion and an inner portion. The outer portion may be portions of the film layer along a first area, which is defined to be an area between the inner perimeter and the outer perimeter of the support structure. The inner portion may be portions of the film layer within a second area, which is defined to be an area within the inner perimeter of the support structure, in which the film layer is unsupported by the support structure.

Regarding the film handler module **52**, it is to be noted that the characteristics of the film layer may include that it is substantially flexible, resilient (i.e. having elasticity), and heat resistant. As such, when the heated presser **511** exerts a pressure force against the film layer of the tray and the object (i.e. the base **10** having the second structures **22**) on the platform **512**, the film layer may substantially conform to the contours of the heated presser **511** as well as the overall shape of the second structures **22** while withstanding heat from the heated presser **511**. In particular, the film layer may be made of composite material, and may be, by way of example, made of polymers, polyimide (e.g. Kapton®), polytetrafluoroethylene (e.g. Teflon®), or the like. Furthermore, the film layer may be capable of withstanding temperatures of at least 250°C or more.

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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 film 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

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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.

- 5 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
10 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
15 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.

- 20 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.

- 25 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.

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.

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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.

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Furthermore, it is to be noted that the descriptions relating to **FIG. 2** shall be further complemented by **FIGS 3 – 9**, and they may further complement the system of the present invention as described in **FIG. 1**.

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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.

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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**.

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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**.

5 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**.

10 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**.

15 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**.

20 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** and **5**. More specifically, step **208** may relate to operations performed by the first sinter
25 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**.

30 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 after being provided to the first sinter unit **40**.

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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**.

Steps **211** to **216** may be subsequent steps of Step **210**. Steps **211** to **216** shall be described in relation to **FIGS 2** and **7**. 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 positioning the base **10** for its second structures **22** to be in the proximity of the presser **511** of the thermal-pressure module **51**.

In particular, following step **211** may be step **212**. Step **212** may involve heating either one or both the presser **511** and the platform **512** for them to be at a preset temperature.

In particular, following step **212** may be step **213**. Step **213** may involve actuating the film handler module **52** to position a film layer **522** to be in the proximity to the second structures **22** on the base **10**. In particular, the film layer **522** may be supported by a support structure **521** in the form of a prepared tray. More specifically, the prepared tray is positioned for its film layer **522** to be between the presser **511** and the second structures **22** on the base **10**.

In particular, following step **213** may be step **214**. Step **214** may involve actuating the presser **511**, which is heated to the preset temperature, to move in a first direction. The first direction may be a downward direction. Movement of the presser **511** along the first direction shall enable it to apply a pressure force against the film layer **522**, as well

as the second structures **22** on the base **10**, with the film layer **522** being made to adhere between cavities **511** of the presser **511** and the second structures **22**. It is to be noted that the film layer **522** may further conform to the shape of the second structures **22** under the pressure force applied by the presser **511**. Moreover, it is to be noted that the platform **512** shall substantially support the base **10** to withstand the pressure force applied by the presser **511**.

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 presser **511** to move in a second direction. The second direction may be the opposite of the first direction, and it may be an upward direction. Movement of the presser **511** along the second direction shall enable it to relieve the pressure force applied against the film layer **522**, as well as the second structures **22** on the base **10**.

In particular, following step **216** may be step **217**. Step **217** may involve removing the film layer **522** (i.e. the tray the film layer **522**) from the proximity of the presser **511** and the second structures **22** on the base **10**. The film layer **522** may be disposed or reused.

It is to be noted that, in relation to steps **211** to **216**, the film layer **522** 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 film layer **522** may also substantially allow second structures **22** to sinter and join to designated locations on the base **10**, if any (e.g. contact pads, etc.).

It is to be noted that, in relation to steps **211** to **216**, since the press surface of the presser **511** being coated with a non-stick or anti-stick coating, as the presser **511** disengages from the second structures **22**, particle adhesion of the second structures **22** to the presser **511** is avoided. Hence, no bits/pieces of the second structures **22** will be stuck
5 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. 8**, 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,
10 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**,
15 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 **FIGS 2** and **9**. More specifically, step **220** may involve providing the base **10**, having
20 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 – 9**, it may be stated that the two or more sinter units (first
25 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.
30 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.

- 5 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
- 10 scope of the invention.

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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
position at least one film layer (522) to be in proximity to the structures on the
base (10); and
apply force and provide heat to the film layer (522) and the structures on the
base (10) for the structures to sinter.
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2. The system according to claim 1, wherein the sinter unit (50) comprises a
thermal-pressure module (51), which comprises
a presser (511), which is configured to apply the force via its press surface;
a platform (512), in which the base (10) rests thereupon; and
15 a heating sub-module (513), which is configured to provide heat to any one or
both the presser (511) and the platform (512).
3. The system according to claim 2, wherein the presser (511) is configured to
move along one or more directions, which include any one or both
20 a first direction for applying the force against the structures on the base (10),
with the film layer (522) being between the presser (511) and the structures on the base
(10); and
a second direction for relieving the force against the structures on the base (10).
- 25 4. The system according to claim 2 or 3, wherein the press surface of the presser
(511) is contoured to include one or more cavities (5111), which are each to
substantially enclose and be substantially adjacent to each structure on the base (10) as
the presser (511) applies the force.
- 30 5. The system according to any one of claims 2 to 4, wherein

the film layer (522) is heat resistant; and

the presser (511) has a coating that substantially prevents adhesion between the presser (511), and any one or both the film layer (522) and the structures on the base (10).

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6. The system according to any one of claims 2 to 5, further comprising a film handler module (52) that is configured to prepare and handle a tray, the tray being formed by the film layer (522) being supported by a support structure (521), for the tray to be actuated for the film layer (522) to be between the presser (511) and the structures
10 on the base (10).

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 the base (10), and dispose a first material (20) onto the stencil (30) to be spread, for the
15 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 the structures on the base (10).

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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.

25 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
position at least one film layer (522) to be in proximity to the structures on the base (10); and

apply force and provide heat to the film layer (522) and the structures on the base (10) for the structures to sinter.

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