[0008] Document WO2022/008809 proposes to form an interface zone from a very thin layer of a metal material, such as tungsten, in a SiC/SiC semiconductor structure. Considering a working layer and a carrier substrate made of monocrystalline SiC with a resistivity of 20 mohm.cm, and a tungsten layer of 1 nm to 3 nm (W) sandwiched between the working layer and the carrier substrate, it is possible to achieve an resistivity of the interface zone of less than or equal to 0.1 mohm.cm^2, after applying an appropriate heat treatment and formation of very fine nodules largely consisting of metal (W), responsible for good vertical conduction of the interface zone.

[0009] Document WO2022/129726 proposes to form an interface zone, in a SiC/SiC semiconductor structure, comprising regions of direct contact between the working layer and the carrier substrate, and agglomerates comprising a semiconductor material different from that or those of the working layer and the carrier substrate, and having a thickness less than or equal to 250 nm. The semiconductor material is chosen for its particular affinity with oxygen. Thus, the agglomerates are able to effectively trap the oxygen that may be present in the bonding interface; the regions of direct contact between the working layer and the carrier substrate, devoid of native oxide residues in particular, allow electrical conduction and/or a vertical semi-conductor/semi-conductor contact that is effective and of good quality. Considering a working layer with a resistivity of 20 mohm.cm, a carrier substrate with a resistivity of 20 mohm.cm and a silicon semiconductor material, it is possible to obtain a resistivity of the interface zone of less than or equal to 0.1 mohm.cm^2, for example 0.032 mohm.cm^2 (after annealing the structure at 1370°C) or 0.0076 mohm.cm^2 (after annealing at very high temperature, namely 1900°C).

[0010] **SUMMARY**

[0011] The present disclosure offers a solution that meets the need for very low resistivity (less than or equal to 0.01 mohm.cm^2) in the interface zone of a semiconductor structure based on silicon carbide, and simplifies the fabrication

of the structure. It relates to a semiconductor structure and a method of manufacturing such a structure. In an aspect, the present disclosure refers to a semiconductor structure (100) based on silicon carbide-based comprising:

- a working layer (10) made of monocrystalline silicon carbide having a first dopant concentration (C_1) that is uniform over its thickness,

- a carrier substrate (30) made of polycrystalline silicon carbide having a second dopant concentration (C_2) that is uniform over its thickness, the second concentration (C_2) being related to the first concentration (C_1) by the following relationship: $C_2 > N_2 \times \exp(-C_1/N_1)$ with $N_1 = 2.85.10^{18}$ cm^{-3} and $N_2 = 5.40.10^{20}$ cm^{-3},

- an interface zone (20), between the carrier substrate (30) and the working layer (10), comprising nodules (21) and regions of direct contact (22) between the working layer (10) and the carrier substrate (30), the nodules (21) comprising a metal or semiconductor material other than silicon carbide, the interface zone (20) having an average resistivity of less than or equal to 0.01 $mohm.cm^2$,

a dopant concentration profile along a thickness of the semiconductor structure (100):

- in the form of a step, and

- being devoid of a doping peak in the interface zone (20), or

- exhibiting a doping peak in the interface zone (20), the extremum of which corresponds to a third dopant concentration equal to the second dopant concentration to within plus or minus 10%.

In an aspect, the present disclosure refers to a method for manufacturing a semiconductor structure (100) based on silicon carbide comprising the following steps:

a) providing a working layer (10) made of monocrystalline silicon carbide having a free face to be assembled and a first dopant concentration (C_1) that is uniform over its thickness,

b) providing a carrier substrate (30) made of polycrystalline silicon carbide having a free face to be assembled, a second dopant concentration (C_2) that is uniform over its thickness, the second concentration (C_2) being related to the first concentration (C_1) by the following relationship: $C_2 > N_2 \times \exp(-C_1/N_1)$ with $N_1 = 2.85.10^{18}$ cm^{-3} and $N_2 = 5.40.10^{20}$ cm^{-3},

c) depositing a film (2) of a metal or semiconductor material other than silicon carbide, having a thickness of 20 nm or less, on the free face of the working layer (10) to be assembled and/or on the free face of the carrier substrate (30) to be assembled,

d) forming an intermediate structure (150), comprising direct assembly of the free faces to be assembled of the working layer (10) and of the carrier substrate (30) respectively, the intermediate structure (150) including an encapsulated film (2') originating from the one or more film(s) (2) deposited during step c),

e) annealing the intermediate structure (150) at a temperature of between 1200°C and 2000°C, to form the semiconductor structure (100) comprising an interface zone (20) which includes nodules (21) resulting from the segmentation of the encapsulated film (2') and regions of direct contact (22) between the thin layer (10) and the carrier substrate (30),

- the interface zone (20) having an average resistivity of less than or equal to 0.01 $mohm.cm^2$,

- a dopant concentration profile along a thickness of the semiconductor structure (100) in the form of a step, and being devoid of a doping peak in the interface zone (20) or exhibiting a doping peak in the interface zone (20), the extremum of which corresponds to a third dopant concentration equal to the second dopant concentration (C_2) to within plus or minus 10%.

[0012] **BRIEF DESCRIPTION OF THE INVENTION**

[0013] The present invention relates to a semiconductor structure based on silicon carbide comprising:

[0014] - a working layer made of monocrystalline silicon carbide having a first dopant concentration that is uniform over its thickness,

[0015] - a carrier substrate made of polycrystalline silicon carbide having a second dopant concentration that is uniform over its thickness, the second concentration being related to the first concentration by the following relationship:

[0016] $C_2 > N_2 \times \exp(-C_1/N_1)$ with

[0017] C_1 is the first concentration, C_2 the second concentration, $N_1 = 2.85.10^{18}$ cm^{-3} and $N_2 = 5.40.10^{20}$ cm^{-3},

[0018] - an interface zone, between the carrier substrate and the working layer, comprising nodules and regions of direct contact between the working layer and the carrier substrate, the nodules comprising a metal or semiconductor material other than silicon carbide, the interface zone having an average resistivity of less than or equal to 0.01 mohm.cm^2.

[0019] The dopant concentration profile along a thickness of the semiconductor structure:

[0020] - is in the form of a step, and

[0021] - is devoid of a doping peak in the interface zone, or

[0022] - exhibits a doping peak in the interface zone, the extremum of which corresponds to a third dopant concentration equal to the second dopant concentration to within plus or minus 10%.

[0023] According to advantageous features of the invention, taken alone or in any feasible combination: