

CLAIMS

1) System for the treatment of an object by plasma, said system comprising:

- 5 - a treatment vacuum chamber (10) comprising a support on which the object to be treated is placed; and
- at least two subassemblies (21, 22) each comprising at least one plasma source (210, 220) allowing a plasma to be generated, each plasma source (210, 220) of a subassembly (21, 22) being supplied by radiofrequency power P_i and independently by a gas i at a flow-rate n_i
- 10 characterized in that the plasma generated by one subassembly (21) is a partially ionized gas or a gas mixture, of different chemical nature from the plasma generated by the other subassembly or subassemblies (22), **each sub-assembly (21) being intended to treat different specific zones of the object to be treated.**
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2) System according to Claim 1 in which each source of plasma (210, 220) of a subassembly (21, 22) comprises:

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- a gas inlet system (25);
 - a discharge chamber (210, 220) made of a plasma-inert material; and
 - a device (26) for coupling the radiofrequency (RF) power to the discharge chamber;
 - a gas outlet (27).
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3) System according to Claim 1 or 2 in which a control device controls each of the subassemblies (21,

22) depending upon a specific parameterization by application of radiofrequency power P_i and/ or a flow-rate of gas n_i specific to each subassembly (21, 22).

5 4) System according to any of the previous claims in which each subassembly (21, 22) comprises a gas inlet, specific to the subassembly connected to the gas inlet (25) of each plasma source (210, 220) of said subassembly (21, 22).

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5) System according to any of the previous claims in which each subassembly (21, 22) comprises a conducting element connected to the coupling device (26) of each plasma source (210, 220) of said subassembly (21, 22).

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6) System according to any of the previous claims characterized in that the subassemblies (21, 22) are arranged along concentric rings.

20 7) System according to any of the previous claims in which the subassemblies (21, 22) are arranged in parallel.

8) System according to Claim 7 in which each
25 subassembly comprises at least two plasma sources (210, 211, 220, 221), each plasma source comprising two chambers in series.

9) Selective plasma treatment process of a composite
30 object (3) comprising at least two different materials A and B, said process implementing a Treatment System according to any of the Claims 1 to 8 and comprising the following steps:

- a step of generating a first plasma by a
35 first of the subassemblies (21) and

treatment of the object (3) using said first plasma;

- a step of generating a second plasma by a second of the subassemblies (22) and treatment of the object (3) using said second plasma.

10) Process according to Claim 9 in which the plasma generation steps are repeated alternately, or with partial or total overlap.

11) Process according to Claim 9 or 10 in which the plasma generation steps are repeated with a partial overlap of the steps by at most 25%.

12) Process consisting of an etching treatment of the composite object (3), said composite object (3) comprising at least two layers of different materials A and B, the layer of material B A covering at least partially the layer of material B, said process comprising;

- the treatment using the first plasma of at least a first zone (31) of said object (3) comprising on the surface, the material A, said treatment using the first plasma consisting of a passivation or activation of material B; and
- the treatment using the second plasma of at least a second zone (32) of said object (3) comprising on the surface, the material A, said treatment using the second plasma consisting of a step of partial or total removal of material A,

that can lead to the formation of a zone
(32) comprising the material B on the
surface when the removal is total, said
process able to start either with a step
5 of activation or passivation using the
first plasma, or with a step of removal
using the second plasma .

13) Process according to Claim 12 in which the first
10 and second steps are performed in an alternating manner
according to a periodicity varying between 0.5 seconds
and 120 seconds, and preferably from 2 to 30 seconds,
so as to repeat the sequence of said first and second
steps a plurality of times until the desired removal of
15 material A is obtained.

14) Process according to Claim 12 or 13 in which the
ratio of the duration of the activation step or the
passivation step to the duration of the removal varies
20 between 0.1 and 10 and preferably between 0.5 and 2.

15) Process according to Claims 12 to 14 in which the
first material A is silicon nitride Si_3N_4 and the second
material B is the oxide of silicon SiO_2 .

25 16) Etched composite object (3) able to be obtained by
the process such as defined according to any of the
Claims 12 to 15.

30 17) Composite object (3) according to Claim 16
consisting of an integrated circuit wafer, or a
substrate for a flat screen, or a substrate for solar
cells, or a substrate for an electronically printed
device.

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CLAIMS

1) System for the treatment of an object by plasma, said system comprising:

5 a treatment vacuum chamber (10) comprising a support on which the object to be treated is placed; and at least two subassemblies (21, 22) each comprising at least one plasma source (210, 220) allowing a plasma to be generated, each plasma source (210, 220) of a subassembly (21, 22) being supplied by radiofrequency
10 power P_i and independently by a gas i at a flow-rate n_i characterized in that the plasma generated by one subassembly (21) is a partially ionized gas or a gas mixture, of different chemical nature from the plasma
15 generated by the other subassembly or subassemblies (22).

2) System according to Claim 1 in which each source of plasma (210, 220) of a subassembly (21, 22)
20 comprises:

- a gas inlet system (25);
- a discharge chamber (210, 220) made of a plasma-inert material; and
- 25 • a device (26) for coupling the radiofrequency (RF) power to the discharge chamber;
- a gas outlet (27).

30 3) System according to Claim 1 or 2 in which a control device controls each of the subassemblies (21, 22) depending upon a specific parameterization by

application of radiofrequency power P_i and/ or a flow-rate of gas n_i specific to each subassembly (21, 22).

4) System according to any of the previous claims in which each subassembly (21, 22) comprises a gas inlet, specific to the subassembly connected to the gas inlet (25) of each plasma source (210, 220) of said subassembly (21, 22).

5) System according to any of the previous claims in which each subassembly (21, 22) comprises a conducting element connected to the coupling device (26) of each plasma source (210, 220) of said subassembly (21, 22).

6) System according to any of the previous claims characterized in that the subassemblies (21, 22) are arranged along concentric rings.

7) System according to any of the previous claims in which the subassemblies (21, 22) are arranged in parallel.

8) System according to Claim 7 in which each subassembly comprises at least two plasma sources (210, 211, 220, 221), each plasma source comprising two chambers in series.

9) Selective plasma treatment process of a composite object (3) comprising at least two different materials A and B, said process implementing a Treatment System according to any of the Claims 1 to 8 and comprising the following steps:

- a step of generating a first plasma by a first of the subassemblies (21) and

treatment of the object (3) using said first plasma;

- a step of generating a second plasma by a second of the subassemblies (22) and treatment of the object (3) using said second plasma.

10) Process according to Claim 9 in which the plasma generation steps are repeated alternately, or with partial or total overlap.

11) Process according to Claim 9 or 10 in which the plasma generation steps are repeated with a partial overlap of the steps by at most 25%.

12) Process consisting of an etching treatment of the composite object (3), said composite object (3) comprising at least two layers of different materials A and B, the layer of material B covering at least partially the layer of material A, said process comprising;

- the treatment using the first plasma of at least a first zone (31) of said object (3) comprising on the surface, the material A, said treatment using the first plasma consisting of a passivation or activation of material B; and
- the treatment using the second plasma of at least a second zone (32) of said object (3) comprising on the surface, the material A, said treatment using the second plasma consisting of a step of partial or total removal of material A,

that can lead to the formation of a zone
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15) Process according to Claims 12 to 14 in which the
first material A is silicon nitride Si_3N_4 and the second
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16) Etched composite object (3) able to be obtained by
the process such as defined according to any of the
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30 17) Composite object (3) according to Claim 16
consisting of an integrated circuit wafer, or a
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