Patent claims

1. A device (1) for the electrolytic metalization of wafers, in particular microchip wafers (11), in an electrolyte, in particular in order to fill channels in microchip wafers with metal, in particular copper, having a chamber (27) to receive the electrolyte, having an anode (29), having a contact (15) in order to polarize the wafer (11) to be metalized as cathode, characterized in that at least one holding arrangement (3) for the wafer (11) to be metalized is provided, in that the holding arrangement (3) has
   - a base plate (5) made of electrically insulating material with a receiving region (9) for the wafer (11),
   - a frame (21) made of insulating material having a recess (23) which forms the chamber (27) for electrolyte,
   - a ring (15) of electrically conducting material serving as cathode,
   - a closure plate arranged on the side of the frame (21) facing away from the base plate (5) and covering the chamber (27) for electrolyte, and
   - an anode network (29), which is arranged on the side of the closure plate that faces the wafer (11), and
   - in that arrangements are provided in order to hold the base plate (5) and the frame (21) in contact with each other.

2. The device as claimed in claim 1, characterized in that a seal (19) is provided between the base plate (5) and the frame (21).

3. The device as claimed in claim 2, characterized in that the seal (19) is arranged within the ring (15) serving as cathode.

4. The device as claimed in claim 2 or 3, characterized in that the seal (19) is an annular seal.

5. The device as claimed in one of claims 2 to 4, characterized in that the seal (19) is clamped between the frame (21) and the wafer (11) lying on the base plate (5).

6. The device as claimed in one of claims 1 to 5, characterized in that the receiving region for the wafer (11) to be metalized is a depression (9) in the base plate (5).

7. The device as claimed in one of claims 1 to 6, characterized in that a plurality of holding arrangements (3) are provided one above another, and in that the base plate (5) forms the closure plate of the holding arrangement (3) respectively arranged underneath.

8. The device as claimed in one of claims 1 to 7, characterized in that on the base plate (5) and on the frame (21) there are provided preferably wedge-like projections (33) that point outward, on which the arrangements (35) for pressing base plate (5) and frame (21) against one another act.

9. The device as claimed in claim 8, characterized in that the arrangements are clamping elements (35), which have grooves (37, 39) in which the projections (33) on the base plate (5) and on the frame (21) engage.

10. The device as claimed in claim 9, characterized in that the grooves (37) divide in a Y shape into two branches (39).

11. The device as claimed in claim 8 or 9, characterized in that the clamping elements (35) are guided such that they can be displaced on guide rods (41) at right angles to the plane of base plate (5) and frame (21).

12. The device as claimed in one of claims 9 to 11, characterized in that the clamping elements (35) for moving base plate (5) and frame (21) toward each other and away from each other can be displaced parallel to the plane of the frame (21) and the base plate (5).

13. The device as claimed in one of claims 1 to 12, characterized in that arrangements comprising a base plate (5) and a frame (21) can be displaced from a position in which they are at a distance from each other into a position in which they rest on each other.

14. The device as claimed in claim 13, characterized in that, between the arrangements, seals (25), in particular annular seals, are provided, which are arranged between a frame (21) and a base plate (5) of an arrangement lying above, serving as closure plate.

15. The device as claimed in one of claims 1 to 14, characterized in that the holding arrangement (3) or the holding arrangements (3) is/are assigned at least one vibration generator (43).

16. The device as claimed in claim 15, characterized in that the vibration generator (43) is a vibration generator for generating vibrations with a fixed, selectively variable or randomly variable frequency.

17. The device as claimed in one of claims 1 to 16, characterized in that the temperature of the holding arrangement (3) can be controlled.

18. The device as claimed in one of claims 1 to 17, characterized in that, in a plurality of holding arrangements (3), the closed chambers (27) for electrolyte can be filled with electrolyte and emptied independently of one another.

19. The device as claimed in one of claims 1 to 18, characterized in that the anode network is woven increasingly more closely toward the middle.

20. The device as claimed in one of claims 1 to 19, characterized in that the surface of the base plate (5) that faces away from the wafer (11) is curved convexly.

21. The device as claimed in one of claims 1 to 20, characterized in that a gas chamber (60) is provided above the electrolyte (56) in the chamber for holding electrolyte (56).

22. The device as claimed in claim 21, characterized in that the gas chamber (60) is filled with an inert gas, in particular with nitrogen or argon.

23. The device as claimed in one of claims 1 to 22, characterized in that conduits are provided in

order to lead electrolyte (56) into the circuit during the operation of the device.

24. The device as claimed in claim 23, characterized in that the conduits are assigned at least one pump to pump electrolyte (56) around during the operation of the device.

25. The device as claimed in one of claims 1 to 24, characterized in that the device is assigned an arrangement for gassing electrolyte (56) during the operation of the device.

26. A method for the electrolytic metalization of wafers, in particular microchip wafers, in an electrolyte, preferably by using a device as claimed in one of claims 1 to 25, characterized in that the electrolyte is gassed with an inert gas before the metalization is carried out.

27. The method as claimed in claim 26, characterized in that the electrolyte is gassed outside the device.

28. The method as claimed in claim 26 or 27, characterized in that the electrolyte is pumped around during the metalization and is gassed outside the device.

29. A method for the electrolytic metalization of wafers, in particular microchip wafers, in an electrolyte, preferably by using a device as claimed in one of claims 1 to 25, characterized in that rinsing water is gassed before the rinsing of the wafer following the conclusion of the metalization.

30. A method for the electrolytic metalization of wafers, in particular microchip wafers, in an electrolyte, preferably by using a device as claimed in one of claims 1 to 25, characterized in that the electrolyte is removed and in that the device, in particular its chamber for holding the electrolyte and the wafer, is further dried, in particular by using inert gas, before the unloading of the wafer.

31. The method as claimed in claim 30, characterized in that the device is dried without rinsing the same.

32. The method as claimed in claim 30 or 31, characterized in that the wafer is rinsed and dried outside the device.

33. The method as claimed in claim 32, characterized in that the wafer is unloaded from the device following the drying of the latter, in that the wafer is rinsed with rinsing water, and in that the wafer is subsequently dried, in particular by using inert gas.

34. The method as claimed in claim 32 or 33, characterized in that the rinsing water is gassed before the rinsing of the wafer.

Claims

1. Device (1) for the electrolytic metalization of wafers, in particular microchip wafers (11), in an electrolyte, in particular in order to fill channels in microchip wafers with metal, in particular copper, with a chamber (27) to receive the electrolyte, with an anode (29), with a contact (15) in order to polarize the wafer (11) to be metalized as cathode, whereby at least one holding arrangement (3) for the wafer (11) to be metalized is provided, characterized in that the holding arrangement (3) comprises

   a base plate (5) made of electrically insulating material with a receiving region (9) for the wafer (11),
   a frame (21) made of insulating material with a recess (23) which forms the chamber (27) for electrolyte,
   a ring (15) of electrically conducting material serving as cathode,
   a closure plate arranged on the side of the frame (21) facing away from the base plate (5) and covering the chamber (27) for electrolyte, and
   an anode network (29), which is arranged on the side of the closure plate that faces the wafer (11), and in that arrangements (35) are provided in order to hold the base plate (5) and the frame (21) in contact with each other.

2. Device according to claim 1, characterized in that a plurality of holding arrangements (3) are provided one above another, and in that the base plate (5) of a holding arrangement (3) arranged above forms the closure plate of the holding arrangement (3) respectively arranged underneath.

3. Device according to claim 1 or 2, characterized in that on the base plate (5) and on the frame (21) there are provided preferably wedge-like projections (33) that point outward, on which the arrangements (35) for holding base plate (5) and frame (21) against one another act, that the arrangements are clamping elements (35), which have grooves (37, 39) into which the projections (33) on the base plate (5) and on the frame (21) engage, that the grooves (37) divide in a Y shape into two branches (39) and that the clamping elements (35) are guided such that they can be displaced on guide rods (41) at right angles to the plane of base plate (5) and frame (21), that arrangements comprising a base plate (5) and a frame (21) can be displaced from a position in which they are at a distance from each other into a position in which they rest on each other and that the clamping elements (35) for moving base plate (5) and frame (21) toward each other and away from each other can be displaced parallel to the plane of the frame (21) and the base plate (5).

4. Device according to one of claims 1 to 3, characterized in that the holding arrangement (3) or the holding arrangements (3) is/are assigned at least one vibration generator (43).

5. Device according to claim 4, characterized in that the vibration generator (43) is a vibration generator for generating vibrations with a fixed, selectively variable or randomly variable frequency.

6. Device according to one of claims 1 to 5, characterized in that the temperature of the holding arrangement (3) can be

controlled.

7. Device according to one of claims 1 to 6, characterized in that, in case of a plurality of holding arrangements (3), the closed chambers (27) for electrolyte can be filled with electrolyte and emptied independently of one another.

8. Device according to one of claims 1 to 7, characterized in that the anode network is woven increasingly more closely toward the middle.

9. Device according to one of claims 1 to 8, characterized in that the surface of the base plate (5) that faces away from the wafer (11) is curved convexly.

10. Device according to one of claims 1 to 9, characterized in that a gas chamber (60) is provided above the electrolyte (56) in the chamber for holding electrolyte (56) and that the gas chamber (60) is filled with an inert gas, in particular with nitrogen or argon.

11. Device according to one of claims 1 to 10, characterized in that conduits are provided and that the conduits are assigned at least one pump to pump electrolyte (56) around during the operation of the device.

12. Device according to one of claims 1 to 11, characterized in that the device is assigned an arrangement for venting electrolyte (56) during the operation of the device.

13. A Method for the electrolytic metalization of wafers, in particular microchip wafers, in an electrolyte, preferably by using a device according to one of claims

1 to 12, characterized in that the electrolyte is vented with an inert gas before the metalization is carried out or during the process.

14. Method according to claim 13, characterized in that the electrolyte is vented inside or outside the device.

15. Method for the electrolytic metalization of wafers, in particular microchip wafers, in an electrolyte, preferably by using a device according to one of claims 1 to 12, characterized in that rinsing water is vented before the rinsing of the wafer following the conclusion of the metalization.

16. Method for the electrolytic metalization of wafers, in particular microchip wafers, in an electrolyte, preferably by using a device according to one of claims 1 to 12, characterized in that the electrolyte is removed and in that the device, in particular its chamber for holding the electrolyte and the wafer, is dried, in particular by using inert gas, before the unloading of the wafer.