head, thus losing the previously attained wedge error compensation. As a result, the accuracy of the structuring is impaired.

It is thus the object of the invention to provide an improved replication device with which the production accuracy in producing nanostructured and/or microstructured components can be improved. Moreover, it is an object of the invention to determine an optimized method for reproducing a structure on a substrate.

Summary

According to an aspect, the present disclosure refers to a replication device for producing nanostructured and/or microstructured components with two assemblies that can be moved in relation to each other, wherein the first assembly comprises a chuck for receiving a substrate and a second assembly comprises a holder for an imprint structure, in particular a stamp. The assemblies are moveable between an imprint position and a loading position relative to each other, wherein at least a sealing lip is located on one of the two assemblies, said sealing lip facing the other one of the two assemblies and contacting the other one of the two assemblies in the imprint position and radially surrounding the chuck and/or the holder, wherein a sealed overpressure chamber between the two assemblies is limited by the sealing lip in the imprint position.

According to an aspect, the present disclosure refers to a method for reproducing a structure on a substrate, in particular using a replication device designed as previously described in the above aspect comprising the following steps:

- placing a substrate on a first assembly of the replication device, in particular on a chuck, and placing an imprint structure on a second assembly of the replication device, in particular a holder;
- an inflatable sealing lip of the replication device that surrounds the substrate radially is inflated when the first assembly is in the imprint position so that a sealed pressure chamber is formed,

- moving the assemblies relative to each other from a loading position into an imprint position, in particular after the substrate and the imprint structure have been placed in the replication device, wherein a surface of the substrate facing the imprint surface or a coating of the substrate comes into in contact with imprint structure all over in the imprint position; and

- actively moving the first assembly and the second assembly, in particular of both assemblies after the substrate has been brought into contact with the imprint structure, away from each other through the application of a separation force, and overpressure is generated in the imprint position in the sealed pressure chamber by means of an overpressure source in order to attain the active movement so that the separation force is generated by the overpressure source in connection with the sealing lip.

The first and the second assemblies can be moved along a central axis toward and away from each other. For example, both assemblies are mounted moveably. However, one of the two assemblies, in particular the first assembly, is preferably mounted moveably and the other one of the two assemblies, in particular the second assembly, is mounted stationarily. Thus, it is only necessary to provide a drive for one of the two assemblies, thus simplifying the design of the replication device.

A defined pressure can be applied in the overpressure chamber as a result of the seal, in particular overpressure. This pressure is used to separate the substrate from the imprint structure. This can be achieved by forcing the substrate and the imprint structure actively apart from each other through the application of overpressure. Thus, a previously attained parallelization, in particular a wedge error compensation, can be maintained so that a subsequent production process can take place with a particularly high degree of accuracy.

material can be compressed to a certain extent by the overpressure, whereby a detachment of the imprint structure from the substrate also occurs, in particular an active detachment.

The first assembly can form, for the purpose of wedge error compensation, a wedge error compensation head comprising a stationary part and a moving part. The moving part, which contains in particular the chuck for receiving the substrate, can be fixed in place at a specific angle relative to the stationary part when the wedge error compensation is set.

In addition, the replication device comprises for example a pressure source for generating overpressure in the sealing lip and/or the overpressure chamber. Thus, sufficiently high overpressure can be generated in the sealing lip as required in order to form the overpressure chamber and/or sufficiently high pressure may be generated in the overpressure chamber in order to achieve active movement of the first assembly and the second assembly relative to each other and to ensure uniform detachment of the substrate from the imprint structure without losing the wedge error compensation.

Moreover, an exposure device can be provided for curing microstructures and/or nanostructures formed on a substrate. Such an exposure device is for example suitable for exposing microstructuring and/or nanostructuring to ultraviolet light, in particular to light of a wavelength of 250nm to 459nm, preferably 365nm.

Furthermore, according to an example, the present disclosure refers to a method for reproducing a structure on a substrate, in particular using a replication device designed as previously described comprising the following steps:

- placing a substrate on a first assembly of the replication device, in particular on a chuck, and placing an imprint structure on a second assembly of the replication device, in particular a holder;

- moving the assemblies relative to each other from a loading position into an imprint position, in particular after the substrate and the imprint structure have been placed in the replication device, wherein a surface of the substrate facing the imprint surface or a coating of the substrate

Claims

1. Replication device (10) for producing nanostructured and/or microstructured components with two assemblies (12, 14) that are moveable in relation to each other, wherein the first assembly (12) comprises a chuck (18) for receiving a substrate (16) and a second assembly (14) comprises a holder (20) for an imprint structure (22), in particular a stamp,

wherein the assemblies (12, 14) are moveable between an imprint position and a loading position relative to each other,

wherein at least a sealing lip (34, 38) is located on one of the two assemblies (12, 14), said sealing lip (34, 38) facing the other one of the two assemblies and contacting the other one of the two assemblies (12, 14) in the imprint position and radially surrounding the chuck (18) and/or the holder (20), wherein a sealed overpressure chamber (36) between the two assemblies (12, 14) is limited by the sealing lip (34, 38) in the imprint position.

2. Replication device (10) according to claim 1, characterized in that the sealing lip (34, 38) is inflatable.

3. Replication device (10) according to any of the preceding claims, characterized in that the sealing lip (34, 38) is annular or portal-shaped seen in top view on the corresponding assembly.

4. Replication device (10) according to claims 2 or 3, characterized in that two sealing lips (34, 38) are provided that are inflatable separately from each other, wherein one of the sealing lips (34, 38) radially surrounds, in particular completely surrounds, the other.

5. Replication device (10) according to claim 4, characterized in that a first chamber (44) is formed by means of the inner sealing lip (34) and a second chamber (46) by means of the outer sealing lip (38), wherein the first chamber (44) is a vacuum chamber and the second chamber (46) is the overpressure chamber.

6. Replication device (10) according to any of the preceding claims, characterized in that the imprint structure (22) is formed by a silicon-based polymer, in particular polydimethylsiloxane.

7. Replication device (10) according to any of the preceding claims, characterized in that the first assembly (12) forms a wedge error compensation head (17) comprising a stationary part (30) and a moving part (28).

8. Replication device (10) according to any of the preceding claims, characterized in that the replication device (10) comprises a pressure source (40) for generating overpressure in the sealing lip (34, 38) and/or the overpressure chamber (36).

9. Replication device (10) according to any of the preceding claims, characterized in that the replication device (10) comprises an exposure device for curing microstructuring and/or nanostructuring formed on a substrate.

10. Method for reproducing a structure on a substrate (16), in particular using a replication device (10) according to one of the claims 1 to 9, comprising the following steps:

- placing a substrate (16) on a first assembly (12) of the replication device (10), in particular on a chuck (18), and placing an imprint structure (22) on a second assembly (14) of the replication device (10), in particular a holder (20);
- moving the assemblies (12, 14) relative to each other from a loading position into an imprint position, wherein a surface of the substrate (16) facing the imprint surface (22) or a coating of the substrate (16) comes into in contact with imprint structure (22) all over in the imprint position;
- an inflatable sealing lip (34, 38) of the replication device (10) that surrounds the substrate (16) radially is inflated when the first assembly (12) is in the imprint position so that a sealed pressure chamber (36) is formed,
- actively moving the first assembly (12) and the second assembly (14), in particular of both assemblies (12, 14), after the substrate (16) has been

brought into contact with the imprint structure (22), away from each other through the application of a separation force, and

- overpressure is generated in the imprint position in the sealed pressure chamber (36) by means of an overpressure source in order to attain the active movement so that the separation force is generated by the overpressure source in connection with the sealing lip (34, 38).

11. Method according to claim 10 characterized in that the first assembly (12) and the second assembly (14) are pressed apart when inflating the sealing lip (34, 38) so that the sealing lip (34, 38) generates the separation force.

12. Method according to claims 10 to 11, characterized in that the substrate (16) is initially placed in an uncoated state on the replication device (10) and moved together with the first assembly (12) into the imprint position in order to parallelize the substrate (16) relative to the imprint structure (22).

13. Method according to claims 10 to 12, characterized in that the substrate (16) and/or the imprint structure (22) is coated with an imprint material and then moved in a coated state together with the first assembly (12) into the imprint position to structure the coating by means of the imprint structure (22).

14. Method according to claim 13, characterized in that the imprint material is exposed to light in the imprint position, in particular ultraviolet light.

15. Method according to claims 10 to 14, characterized in that overpressure is sufficiently great to force the imprint structure (22) and the substrate (16) apart if the substrate (16) is uncoated or coated.

16. Method according to claims 10 to 15, characterized in that the substrate (16) is moved repeatedly in an uncoated state from the loading position into the imprint position, in particular though repeated inflation and at least partial deflation of the sealing lip (34, 38) and/or the overpressure chamber (36).

17. Method according to claim 16, characterized in that in the case of the uncoated substrate (16) being moved repeatedly from the loading position into the imprint position, the substrate (16) is aligned each time on the imprint structure (22) with a contact force of differing strength, in particular with a contact force that decreases with each repeated alignment.

18. Method according to claims 10 to 17, characterized in that a moveable part (28) of a wedge error compensation head (17) of the replication device is locked in place before the active movement.

19. Method according to claims 11 to 18, characterized in that pressure in the overpressure chamber (36) is regulated in the imprint position in order to keep a constant gap between the substrate (16) and the imprint structure (22).

20. Method according to claims 11 to 19, characterized in that a first sealing lip (34, 38) of the replication device is initially inflated and the sealing lip is deflated at a later time and another sealing lip (34, 38) that is different from the first sealing lip (34, 38) is inflated.

21. Method according to claims 11 to 20, characterized in that a first chamber (44) is formed using the first sealing lip (34) and the second chamber (46) is formed using the second sealing lip (38), wherein a vacuum is generated in the first chamber (44) and overpressure in the second chamber (46).