

## Claims

1. A method for bonding at least three substrates (4o, 4u, 4, 4', 4'', 4''', 4o') to form a substrate stack (9, 9', 9''), wherein the substrate stack (9, 9', 9'') has at least one lowermost substrate (4u, 4), a middle substrate (4o, 4'), and an upper substrate (4o', 4''), comprising the following steps:
  - aligning the middle substrate (4o, 4') to the lowermost substrate (4u, 4) and bonding the middle substrate (4o, 4') to the lowermost substrate (4u, 4),
  - then aligning the upper substrate (4o', 4'') and bonding the upper substrate (4o', 4'') to the middle substrate (4o, 4), characterized in that the upper substrate (4o', 4'') is aligned to the lowermost substrate (4u, 4).
2. The method according to claim 1, wherein each substrate (4o, 4u, 4, 4', 4'', 4''', 4o') has a plurality of optical lenses (13, 13', 13'', 13''').
3. The method according to one of the preceding claims, wherein the upper substrate (4o', 4'') is aligned to alignment marks (5ul, 5ur, 5ul', 5ur') of the lowermost substrate (4u, 4).
4. The method according to one of the preceding claims, wherein each subsequent substrate (4'') is aligned to the lowermost substrate (4u, 4).
5. The method according to claim 2, wherein optical axes (12, 12', 12'', 12''') of the lenses (13, 13', 13'', 13'''), which are arranged on top of one another, are aligned congruently.
6. The method according to one of the preceding claims, wherein at least four substrates (4o, 4u, 4, 4', 4'', 4''', 4o') are bonded to one another, preferably at least five substrates (4o, 4u, 4, 4', 4'', 4''', 4o'), more preferably at least 10 substrates (4o, 4u, 4, 4', 4'', 4''', 4o'),

4o') , even more preferably at least 15 substrates (4o, 4u, 4, 4', 4'', 4''', 4o').

7. The method according to one of the preceding claims, comprising the following sequence:
- arranging and fixing the lowermost substrate (4u, 4) to a lower substrate holder (1u, 1, 1'),
  - detecting alignments marks (5ul, 5ur, 5ul', 5ur') on the lowermost substrate (4u, 4) in fields of view (6ul, 6ur, 6ol, 6or) of lenses (7ul, 7ur, 7ol, 7or),
  - arranging and fixing the middle substrate (4o, 4') on an upper substrate holder (1o, 1, 1'),
  - detecting alignment marks (5ul, 5ur, 5ul', 5ur') on the lowermost substrate (4u, 4) by means of the lenses (7ul, 7ur, 7ol, 7or),
  - aligning the middle substrate (4o, 4') to the lowermost substrate (4u, 4),
  - bonding the middle substrate (4o, 4') to the lowermost substrate (4u, 4), wherein the bonded substrates (4o, 4', 4u, 4) remain on the lower substrate holder (1u, 1, 1'),
  - arranging and fixing the upper substrate (4o', 4'') on the upper substrate holder (1o, 1, 1'),
  - detecting alignment marks on the upper substrate by means of the lenses (7ul, 7ur, 7ol, 7or),
  - aligning the upper substrate (4o', 4'') to the lowermost substrate (4u, 4),
  - bonding the upper substrate (4o', 4'') to the middle substrate (4o, 4') to produce the substrate stack (9').

8. The method according to claim 7, wherein the alignment marks (5ul, 5ur, 5ul', 5ur') are detected by lenses (7ul, 7ur), which are arranged below the lowermost substrate (4u, 4), through recesses (3, 3') in the lower substrate holder (1u, 1, 1').
9. The method according to claim 8, wherein the recesses (3, 3') are embodied as continuous holes in the lower substrate holder (1u, 1, 1').
10. The method according to claim 8, wherein the recesses (3, 3') are embodied as elongated holes in the lower substrate holder (1u, 1, 1').
11. The method according to claim 7, wherein the lower substrate holder (1u, 1, 1') can be moved in such a way that the lower lenses (7ul, 7ur) are arranged inside recesses (3, 3').
12. The method according to one of claims 7 to 11, wherein the lower substrate holder (1u, 1, 1') is moved in the Z direction by means of a Z-positioning unit in such a precise manner that a deviation in an X and Y direction is minimal.
13. The method according to claim 12, wherein a readjusting unit corrects a deviation of the lower substrate holder (1u, 1, 1') in the X and/or Y direction in response to a movement in the Z direction.
14. A substrate holder (1u, 1, 1') for the method according to one of claims 7 to 13, wherein the substrate holder has recesses (3, 3') for accommodating lenses (7ul, 7ur) and fixing elements (2, 2'), preferably vacuum openings, for fixing a substrate (4u, 4).