

Claims:

1. A system for processing wafers in a vacuum processing chamber, comprising:
 - a plurality of carriers, each carrier comprising a frame having a plurality of openings, each opening configured to accommodate one wafer;
 - a transport mechanism configured to transport the plurality of carriers throughout the system;
 - a plurality of wafer plates, each wafer plate configured for supporting one wafer;
 - an attachment mechanism for attaching a plurality of wafer plates to each of the carriers, wherein each of the wafer plates is attached to a corresponding position at an underside of a corresponding carrier, such that each of the wafers positioned on one of the wafer carriers is positioned within one of the plurality of opening in the carrier;
 - a plurality of masks, each mask attached over front side of one of the plurality of opening in the carrier;
 - an alignment stage, configured to support one of the wafer plates under one of the plurality of opening in the carrier, the alignment stage configured for motion in translation, rotation, and elevation;
 - a camera positioned to image one of the plurality of masks and to image a wafer positioned on one of the wafer plates while the wafer plate is positioned on the alignment stage; a controller receiving images from the camera and sending correction signals to the alignment stage.
2. The system of claim 1, wherein said plurality of masks comprise:
 - a plurality of inner masks, each configured for placing on top of one of the plurality of opening in the carrier, the inner mask having an opening-pattern to mask parts of the wafer and expose remaining parts of the wafer; and,
 - a plurality of outer masks, each configured for placing on top of a corresponding inner mask, the outer mask having an opening configured to partially cover the inner mask.
3. The system of claim 1, wherein each of the wafer plates comprises a flat plate made of aluminum.
4. The system of claim 3, wherein the attachment mechanism comprises a plurality of magnets attached to each of the plurality of wafer plates.
5. The system of claim 4, wherein each of the plurality of wafer plates further comprises vacuum holes.
6. The system of claim 1, further comprising a conveyor belt configured for transporting the wafer plates to a position inside field of view of the camera.
7. The system of claim 1, wherein the transport mechanism comprises a first linear conveyor configured to transport the carriers and a second linear conveyor configured to transport the wafer plates when the wafer plates are detached from the carriers.

8. The system of claim 5, wherein the alignment stage comprises a seat plate, the seat plate having a first set of vacuum holes aligned to the vacuum holes of the wafer plate and a second set of vacuum holes configured to deliver suction to hold the wafer plate to the seat plate.
9. The system of claim 5, further comprising an unloading stage comprising an unloading seat plate, the unloading seat plate configured to block the vacuum holes of the wafer plate to thereby prevent fluid communication to the vacuum holes, the unloading seat plate comprising a set of vacuum holes configured to deliver suction to hold the wafer plate to the unloading seat plate.
10. The system of claim 1, further comprising a substrate unload station having a mechanism for tilting the wafer plate into a vertical orientation over a collection bin for collecting any substrate fragments from the wafer plate.
11. A method for processing wafers in a vacuum processing chamber, comprising:
 - affixing a mask on a top surface of a carrier, the mask overlying an opening in the carrier;
 - loading a wafer onto a top surface of a wafer plate;
 - transporting the wafer plate with the wafer to an alignment station and placing the wafer plate onto an alignment stage;
 - activating a camera to image the wafer on the alignment stage;
 - transporting the carrier with the mask to the alignment station;
 - activating the camera to image the mask;
 - using the image of the wafer and the mask to calculate misalignment and activating the alignment stage to align the wafer to the mask;
 - once the wafer is aligned to the mask, raising the alignment stage so as to attach the wafer plate to an underside of the carrier such that the wafer is positioned within the opening in the carrier;
 - lowering the alignment stage;
 - transporting the carrier into the vacuum processing station to process the wafer.
12. The method of claim 11, further comprising applying suction to the wafer while the wafer plate is positioned on the alignment stage.
13. The method of claim 11, wherein affixing the mask comprises attaching an inner mask to the carrier and attaching an outer mask over the inner mask.
14. The method of claim 11, wherein attaching the wafer plate to an underside of the carrier comprises applying magnetic force between the wafer plate and the carrier.
15. The method of claim 14, further comprising applying the magnetic force to the mask.