

within clean room environments where real estate or floor space is already expensive and at a premium.

[00012] Accordingly, it is desirable to improve substrate processing involving smaller circuit devices and features while maintaining the ability to qualify and monitor the process during production. It is desirable to reduce the number of junctures during fabrication wherein substrates are taken out of vacuum to atmosphere, and then must be subsequently placed back under vacuum in a processing chamber for further processing. It is further desirable to reduce the lag time between the process or substrate going out of specification, and the recognition of that issue by a fabricator or device maker so that they can respond more quickly. It is further desirable to continue to automate equipment and utilize process data to lessen human intervention in the fabrication process, leading to prescriptive optimization and full decision automation.

[00013] Therefore, there is an overall need to address the drawbacks in the current fabrication processes and equipment platforms.

SUMMARY

[00014] This disclosure relates to a high volume manufacturing platform which incorporates metrology instruments integrated to measure workpieces before and/or after being treated in the platform's processing chambers. Transfer chambers connected to the process chambers are integrated with the metrology sensors to enable measurements being done within the platform, and not a stand-alone metrology tool. In this instance, maintaining workpieces within the platform's controlled environment reduces the potential for added particles by reducing workpiece movement and minimizing the exposure of different environments to the workpiece.

[00014a] According to a first aspect of the present invention, there is provided a processing system for processing a workpiece for the fabrication of electronic devices thereon, the processing system comprising:

a plurality of processing modules for the fabrication of electronic devices in a processing sequence;

a workpiece transfer module coupled with the plurality of processing modules comprising a workpiece transfer mechanism

a measurement module coupled with the workpiece transfer module and including an inspection system operable for measuring data associated with an attribute of the workpiece that is being processed in the processing sequence, and

wherein at least a portion of the measurement module is positioned inside of an internal space of the workpiece transfer module, the measurement module including a measurement region located within a dedicated area of the internal space.

[00014b] According to a second aspect of the present invention, there is provided a processing

5 system, comprising:

a distributed transfer system comprising:

at least one internal vacuum chamber;

at least one substrate transfer mechanism disposed within the internal vacuum chamber;

a plurality of processing module ports disposed along the distributed transfer system;

10 a plurality of measurement inspection systems within the distributed transfer system;

one or more of film-forming modules, at least one of the film-forming modules coupled to a corresponding processing module port;

one or more etch modules, at least one of the etch modules coupled to a corresponding processing module port;

15 one or more cleaning modules, at least one of the cleaning modules coupled to a corresponding processing module port.

[00014c] According to a third aspect of the present invention, there is provided a processing system, comprising:

a distributed transfer system comprising:

20 at least one internal vacuum chamber;

at least one substrate transfer mechanism disposed within the internal vacuum chamber;

a plurality of processing module ports disposed along the distributed transfer system;

a plurality of measurement inspection systems within the distributed transfer system;

one or more film-forming modules, a film-forming module coupled to a corresponding

25 processing module port;

one or more etch modules, an etch module coupled to a corresponding processing module port;

a batch processing module comprising a process chamber capable of simultaneously treating substrates; and

30 a staging chamber coupled to the batch processing module and the distributed transfer system, the staging chamber comprising a staging area to stage substrates for the batch processing chamber.

[00014d] According to a fourth aspect of the present invention, there is provided a manufacturing platform for processing a workpiece for the fabrication of electronic devices

35 thereon, the processing system comprising, comprising:

a plurality of processing modules hosted on a common manufacturing platform, the processing modules configured for manipulating materials on a workpiece in processing steps as part of a processing sequence;

the plurality of processing modules including a first module and a second module, the first and second modules facilitating different processes in the process sequence;

at least one measurement module hosted on the common manufacturing platform, the measurement module including an inspection system operable for measuring data associated with an attribute of the workpiece at least one of before or after the workpiece is processed in a processing module of the common manufacturing platform;

at least one workpiece transfer module hosted on the common manufacturing platform and configured for the movement of the workpiece between the processing modules and the at least one measurement module;

an active interdiction control system hosted at least in part on the common manufacturing platform and coupled with the measurement module, the active interdiction control system configured for processing the measured data associated with an attribute on the workpiece for detecting non-conformities and configured to perform corrective processing of the workpiece at least in part in a processing module upstream and/or downstream in the process sequence when non-conformities are detected;

the active interdiction control system further configured for controlling movement and processing of the workpiece in the processing sequence;

the common manufacturing platform, the processing modules, and the measurement module operating in a controlled environment, and the workpiece transfer module configured for transferring the workpiece between the plurality of processing modules in the processing sequence and the measurement module without leaving the controlled environment.

[00014e] According to a fifth aspect of the present invention, there is provided a method, comprising:

processing a workpiece through a plurality of processing modules hosted on a common manufacturing platform, the workpiece comprising a plurality of electronic devices, wherein the processing includes performing a process sequence having at least one film-forming process and at least one etching process or film-treatment process;

gathering fabrication measurement data of the workpiece on the common manufacturing platform, wherein the fabrication measurement data is a measurement of an attribute of the workpiece based on at least a portion of the process sequence performed on the common manufacturing platform;

gathering in-situ process measurement data from a workpiece being processed in at least one of the processing modules that is performing a process of at least a portion of the process sequence;

detecting non-conformities of the workpiece based on at least one of the gathered fabrication measurement data or the in-situ process measurement data;

5 performing active interdiction to the process sequence when non-conformities are detected to execute corrective processing of the workpiece in the process sequence on the common manufacturing platform after the measurement data has been gathered.

[00015] In one embodiment, a processing system for a workpiece for the fabrication of electronic devices includes a plurality of processing modules used to treat the workpieces and are arranged around one or more workpiece transfer modules
10 which include a workpiece transfer mechanism to move the workpieces throughout the system in a predetermined processing sequence. In some instances, the processing sequence will include a measurement step to monitor the state or condition of the workpiece for process control purposes. The system includes a measurement module coupled with the workpiece transfer module and including an inspection system
15 operable for measuring data associated with an attribute of the workpiece that is being processed in the processing sequence. In most instances, at least a portion of the