CLAIMS

1. An integrated lithography system, comprising:

a plurality of reaction chambers within a cluster, the plurality of reaction chambers comprising:

a photoresist (PR) deposition chamber;

a post-application bake (PAB) chamber;

a post-exposure bake (PEB) chamber;

a development chamber; and

a controller that includes one or more processors and one or more memory devices, wherein the one or more memory devices store computer-executable instructions for controlling the one or more processors to:

receive a substrate in the PR deposition chamber;

deposit a PR on a surface of the substrate within the PR deposition chamber;

receive the substrate having the PR in the PAB chamber;

treat the PR within the PAB chamber to modify material properties of the PR;

after treating the PR, receive the substrate in the PEB chamber, wherein portions of the PR have been chemically altered by exposure to radiation to create a patterned PR;

treat the patterned PR within the PEB chamber to modify material properties of the patterned PR, wherein treating the patterned PR within the PEB chamber is performed at temperatures between 100°C and 300°C; and

dry developing the patterned PR within the development chamber by removing either an exposed portion or an unexposed portion of the patterned PR by a dry development process comprising exposure to a chemical compound to form a PR mask.

2. The system of claim 1, wherein the PR is a metal-containing PR.

3. The system of claim 1, wherein the PR is an EUV PR.

4. The system of claim 1, wherein the plurality of reaction chambers further includes a substrate clean chamber, and the computer-executable instructions further include

instructions for controlling the one or more processors to, prior to the computer-executable instruction to receive the substrate having the PR in the PAB chamber:

receive the substrate having the PR in the clean chamber; and

perform a dry clean process to remove PR from a bevel edge and/or backside of the substrate.

5. The system of claim 1, wherein the plurality of reaction chambers further includes an underlayer deposition chamber, and the computer-executable instructions further include instructions for controlling the one or more processors to, prior to the computer-executable instruction to deposit a PR:

deposit an underlayer on the surface of the substrate via a dry process, wherein the underlayer increases adhesion of the PR to the substrate.

6. The system of claim 5, wherein the underlayer deposition chamber is the PR deposition chamber.

7. The system of claim 1, wherein the plurality of reaction chambers further includes a pre-treatment chamber, and the computer-executable instructions further include instructions for controlling the one or more processors to, prior to the computer-executable instruction to deposit the PR:

treat the surface of the substrate via a dry process to cause more chemical functional groups on the surface of the substrate to improve PR adhesion to the substrate.

8. The system of claim 1, wherein the computer-executable instructions further include instructions for controlling the one or more processors to perform a dry clean process to remove PR from a bevel edge and/or backside of the substrate within the PAB chamber.

9. The system of claim 1, wherein the plurality of reaction chambers further includes a lithography scanner, and the computer-executable instructions further include instructions for controlling the one or more processors to, prior to the computer-executable instruction to receive the substrate in the PEB chamber:

receive the substrate in the lithography scanner; and

expose portions of the PR to radiation to create a patterned PR.

10. The system of any one of claims 1–9, wherein the plurality of reaction chambers are each below atmospheric pressure, and the PR is under below-atmospheric pressure until after the dry development process.

11. The system of any one of claims 1–9, wherein an ambient environment of the substrate is controlled to reduce exposure of the photoresist to moisture prior to dry developing the patterned PR.

12. The system of any one of claims 1–9, wherein the computer-executable instructions further include computer-executable instructions to deposit the PR via a dry process comprising mixing a vapor stream of an organometallic precursor with a vapor stream of a counter-reactant.

13. The system of any one of claims 1–9, wherein the processes performed by the plurality of reaction chambers are all dry processes.

14. The system of any one of claims 1–9, wherein the processes performed by the plurality of reaction chambers include wet and dry processes.

15. The system of any one of claims 1–9, wherein the cluster comprises multiple PR deposition chambers.

16. The system of any one of claims 1–9, wherein the PAB chamber and the PEB chamber are the same chamber.

17. An integrated substrate processing system, comprising:

a plurality of substrate processing environments, the plurality of substrate processing environments comprising a metal-containing photoresist (PR) deposition environment and one or more other separate integrated processing environments selected from the group consisting of:

an additional metal-containing photoresist (PR) deposition environment;

a metal-containing PR development environment, and

a thermal treatment processing environment; and

a controller that includes one or more processors and one or more memory devices, wherein the one or more memory devices store computer-executable instructions for controlling the one or more processors to:

receive a substrate in the metal-containing PR deposition environment;

deposit a metal-containing PR on a surface of the substrate within the metal-containing PR deposition environment;

after portions of the metal-containing PR have been chemically altered by exposure to radiation to create a patterned PR, thermally treat the patterned PR within the thermal treatment processing environment at temperatures between 100°C and 300°C; and

conduct additional PR processing operations in the one or more other separate integrated processing environments.

18. The system of claim 17, wherein the plurality of substrate processing environments further includes a PR dry development processing environment, and the one or more memory devices store further computer-executable instructions for controlling the one or more processors to:

after portions of the metal-containing PR have been chemically altered by exposure to radiation to create a patterned PR, dry develop the patterned PR within the development environment by removing either an exposed portion or an unexposed portion of the patterned PR by a dry development process comprising exposure to a chemical compound to form a PR mask.

19. The system of claim 17, wherein the plurality of substrate processing environments further includes a thermal treatment processing environment, and the one or more memory devices store further computer-executable instructions for controlling the one or more processors to:

before and/or after portions of the metal-containing PR have been chemically altered by exposure to radiation to create a patterned PR, thermally treat the metal-containing PR within the thermal treatment processing environment.

20. The system of claim 17, wherein the plurality of substrate processing environments further includes a scanner environment, and the one or more memory devices store further computer-executable instructions for controlling the one or more processors to:

expose portions of the metal-containing PR to radiation within the scanner environment to chemically alter the exposed portions.

21. The system of claim 17, wherein the plurality of substrate processing environments are different process chambers within a cluster.

22. The system of claim 17, wherein the plurality of substrate processing environments are different stations within a chamber.

23. The system of claim 17, wherein the plurality of substrate processing environments includes three metal-containing PR deposition environments.

24. The system of claim 17, wherein the plurality of substrate processing environments comprises two metal-containing PR deposition environments and a metal-containing PR development environment, and the one or more memory devices store further computer-executable instructions for controlling the one or more processors to:

after portions of the metal-containing PR have been chemically altered by exposure to radiation to create a patterned PR, develop the patterned PR via a dry process.

25. The system of claim 17, wherein the plurality of substrate processing environments comprises a metal-containing PR deposition environments, a thermal treatment processing environment, and a metal-containing PR development environment, and the one or more memory devices store further computer-executable instructions for controlling the one or more processors to:

before and/or after portions of the metal-containing PR have been chemically altered by exposure to radiation to create a patterned PR, thermally treat the metal-containing PR within the thermal treatment processing environment, and

after thermally treating the metal-containing PR within the thermal treatment processing environment, developing the patterned PR via a dry process.

26. The system of claim 17, wherein the plurality of substrate processing environments comprises the metal-containing PR deposition environment, a first thermal treatment processing environment, a second thermal treatment processing environment, and a metal-

containing PR development environment, and the one or more memory devices store further computer-executable instructions for controlling the one or more processors to:

before portions of the metal-containing PR have been chemically altered by exposure to radiation to create a patterned PR, thermally treat the metal-containing PR within the first thermal treatment processing environment,

after portions of the metal-containing PR have been chemically altered by exposure to radiation to create a patterned PR, thermally treat the metal-containing PR within the second thermal treatment processing environment, and

after thermally treating the metal-containing PR within the second thermal treatment processing environment, developing the patterned PR via a dry process.