CLAIMS:

1. A semiconductor processing method comprising:

providing an etchant precursor to a processing region of a semiconductor processing chamber, wherein a structure is disposed within the processing region, wherein the structure comprises a first silicon-containing material, and wherein the structure comprises a second silicon-containing material, an oxygen-containing material, or both;

contacting the structure with the etchant precursor, wherein the contacting with the etchant precursor etches at least a portion of the second silicon-containing material or the oxygen-containing material from the structure;

providing a carbon-containing precursor to the processing region of the semiconductor processing chamber; and

contacting the structure with the carbon-containing precursor, wherein the contacting with the carbon-containing precursor replenishes carbon in the first silicon-containing material.

2. The semiconductor processing method of claim 1, wherein the second silicon-containing material comprises a silicon-and-oxygen-containing material or a silicon-and-germanium-containing material;

or wherein the first silicon-containing material comprises a silicon-and-carbon-containing material;

or wherein the etchant precursor comprises a halogen-containing precursor.

3. The semiconductor processing method of claim 1, wherein contacting the structure with the carbon-containing precursor increases carbon in the first silicon-containing material by greater than or about 0.1 at.%.

4. The semiconductor processing method of claim 1, wherein the carbon-containing precursor comprises hexamethyldisilazane (HMDS), tetramethyldisilazane (TMDS), trimethylchlorosilane (TMCS), dimethyldichlorosilane (DMDCS), methyltrichlorosilane (MTCS), trimethylmethoxysilane (TMMS) (CH_3—O—Si—$(CH_3)_3$), dimethyldimethoxysilane (DMDMS) ($(CH_3)_2$—Si—$(OCH_3)_2$), methyltrimethoxysilane (MTMS) ((CH_3—O)$_3$—Si—CH_3), phenyltrimethoxysilane (PTMOS) (C_6H_5—Si—$(OCH_3)_3$), phenyldimethylchlorosilane (PDMCS) (C_6H_5—Si(Cl)—$(CH_3)_2$),

dimethylaminotrimethylsilane (DMATMS) ($(CH_3)_2$—N—Si—$(CH_3)_3$), or bis(dimethylamino)dimethylsilane (BDMADMS).

5. The semiconductor processing method of claim 1, further comprising:

exposing the structure to ultraviolet (UV) radiation while contacting the structure with the carbon-containing precursor or subsequent to contacting the structure with the carbon-containing precursor;

particularly wherein contacting the structure with the carbon-containing precursor and exposing the structure to ultraviolet (UV) radiation are performed simultaneously.

6. The semiconductor processing method of claim 1, further comprising:

subsequent to contacting the structure with the carbon-containing precursor, providing a cleaning agent to the processing region of the semiconductor processing chamber; and

contacting the structure with the cleaning agent, wherein the contacting with the cleaning agent removes a residue from the structure.

7. The semiconductor processing method of claim 1, wherein a temperature in the semiconductor processing chamber is less than or about 500 °C.

8. A semiconductor processing method comprising:

providing a first etchant precursor to a processing region of a semiconductor processing chamber, wherein a structure is disposed within the processing region, wherein the structure comprises alternating layers of a first silicon-containing material and a silicon-and-germanium-containing material, and wherein the structure comprises a second silicon-containing material overlying and extending into one or more recesses defined by the alternating layers of the first silicon-containing material and the silicon-and-germanium-containing material;

contacting the structure with the first etchant precursor, wherein the contacting with the first etchant precursor etches through the alternating layers of the first silicon-containing material and the silicon-and-germanium-containing material;

providing a first carbon-containing precursor to the processing region of the semiconductor processing chamber;

contacting the structure with the first carbon-containing precursor, wherein the contacting with the first carbon-containing precursor replenishes carbon in the second silicon-containing material;

providing a first cleaning agent to the processing region of the semiconductor processing chamber;

contacting the structure with the first cleaning agent, wherein the contacting with the first cleaning agent removes a first residue from the structure;

providing a second etchant precursor to the processing region of the semiconductor processing chamber;

contacting the structure with the second etchant precursor, wherein the contacting etches a portion of the silicon-and-germanium-containing material;

providing a silicon-containing precursor to the processing region;

contacting the structure with the silicon-containing precursor, wherein the contacting deposits a third silicon-containing material on the structure, and wherein the third silicon-containing material extends into recesses defined by the etched portion of the silicon-and-germanium-containing material;

providing a third etchant precursor to the processing region of the semiconductor processing chamber;

contacting the structure with the third etchant precursor, wherein the contacting etches a portion of the third silicon-containing material, and wherein, subsequent to the contacting, the third silicon-containing material remaining extends into recesses defined by the etched portion of the silicon-and-germanium-containing material;

providing a second carbon-containing precursor to the processing region of the semiconductor processing chamber;

contacting the structure with the second carbon-containing precursor, wherein the contacting with the second carbon-containing precursor replenishes carbon in the third silicon-containing material;

providing a second cleaning agent to the processing region of the semiconductor processing chamber;

contacting the structure with the second cleaning agent, wherein the contacting with the second cleaning agent removes a second residue from the structure;

providing a fourth etchant precursor to the processing region of the semiconductor processing chamber;

contacting the structure with the fourth etchant precursor, wherein the contacting with the fourth etchant precursor removes a dummy oxide material from the structure;

providing a third carbon-containing precursor to the processing region of the semiconductor processing chamber;

contacting the structure with the third carbon-containing precursor, wherein the contacting with the third carbon-containing precursor replenishes carbon in the second silicon-containing material;

providing a fifth etchant precursor to the processing region of the semiconductor processing chamber;

contacting the structure with the fifth etchant precursor, wherein the contacting with the fifth etchant precursor removes the silicon-and-germanium-containing material from the structure;

providing a fourth carbon-containing precursor to the processing region of the semiconductor processing chamber; and

contacting the structure with the fourth carbon-containing precursor, wherein the contacting with the fourth carbon-containing precursor replenishes carbon in the second silicon-containing material, the third silicon-containing material, or both.

9. The semiconductor processing method of claim 8, wherein one or more of the first carbon-containing precursor, the second carbon-containing precursor, the third carbon-containing precursor, and the fourth carbon-containing precursor are the same carbon-containing precursor,

or wherein the second silicon-containing material, the third silicon-containing material, or both are characterized by a dielectric constant of less than or about 7.5.

10. The semiconductor processing method of claim 8, wherein contacting the structure with the first carbon-containing precursor, the second carbon-containing precursor, the third carbon-containing precursor, or the fourth carbon-containing precursor prevents thickness loss of the second silicon-containing material, the third silicon-containing material, or both during subsequent operations.

11. The semiconductor processing method of claim 8, wherein one or more of the first etchant precursor, the second etchant precursor, the third etchant precursor, or the fourth etchant precursor comprises a hydrogen-containing precursor, a nitrogen-containing precursor, a helium-containing precursor, a halogen-containing precursor, or an oxygen-containing precursor.

12. The semiconductor processing method of claim 8, further comprising:

depositing an epitaxial material on the structure prior to contacting the structure with the fourth etchant precursor.

13. A semiconductor processing system comprising:

a first semiconductor processing chamber, wherein the first semiconductor processing chamber is configured to:

flow an etchant precursor to a processing region of the first semiconductor processing chamber, wherein a structure is disposed within the processing region, wherein the structure comprises a first silicon-containing material, and wherein the structure comprises a second silicon-containing material, an oxygen-containing material, or both; and

contact the structure with the etchant precursor, wherein the contacting with the etchant precursor etches at least a portion of the second silicon-containing material or the oxygen-containing material from the structure; and

a second semiconductor processing chamber on the same mainframe as the first semiconductor processing chamber, wherein the second semiconductor processing chamber is configured to:

flow a carbon-containing precursor to a processing region of the second semiconductor processing chamber; and

contact the structure with the carbon-containing precursor, wherein the contacting with the carbon-containing precursor replenishes carbon in the first silicon-containing material.

14. The semiconductor processing system of claim 13, further comprising:

a third semiconductor processing chamber on the same mainframe as the first semiconductor processing chamber and the second semiconductor processing chamber, wherein the third semiconductor processing chamber is configured to:

flow a cleaning agent to a processing region of the third semiconductor processing chamber; and

contact the structure with the cleaning agent, wherein contacting with the cleaning agent removes a residue from the structure,

particularly further comprising:

a fourth semiconductor processing chamber on the same mainframe as the first semiconductor processing chamber, the second semiconductor processing chamber, and the third semiconductor processing chamber, wherein the fourth semiconductor processing chamber is configured to:

flow one or more deposition gases to a processing region of the fourth semiconductor processing chamber; and

contact the structure with the one or more deposition gases, wherein contacting with the one or more deposition gases deposits an epitaxial material on the structure.

15. The semiconductor processing system of claim 13, further comprising:

one or more pre-treatment semiconductor processing chambers on the same mainframe as the first semiconductor processing chamber and the second semiconductor processing chamber, wherein the one or more pre-treatment semiconductor processing chambers are configured to:

etch a portion of the first silicon-containing material and the silicon-and-germanium-containing material;

deposit the second silicon-containing material on the structure; and/or

etch a portion of the second silicon-containing material.