

CLAIMS:

1. A method comprising:
exposing a substrate having a stimulus responsive polymer (SRP) thereon to a stimulus
5 effective to de-polymerize the SRP and remove the de-polymerized SRP from the substrate; and
exposing the substrate to metastable atoms generated from a noble gas plasma, the noble gas
being one or more of helium (He), neon (Ne), argon (Ar), krypton (Kr), and xenon (Xe), to remove
residue from the substrate.
2. The method of claim 1, wherein the SRP comprises a polyaldehyde or a derivative thereof.
- 10 3. The method of claim 1, wherein the SRP comprises a poly(phthalaldehyde) or a derivative
thereof as a homopolymer or as one of the polymers of a copolymer.
4. The method of claim 1 wherein exposing the substrate to a stimulus comprises heating the
substrate to a first temperature that is above a ceiling temperature of the SRP.
5. The method of claim 4, wherein the plasma is ignited once the substrate reaches the first
15 temperature.
6. The method of any of claims 1–5, wherein most of the SRP is removed before exposing the
substrate to the metastable atoms.
7. The method of any of claims 1–5, wherein substrate is exposed to the metastable atoms
before most of the SRP is removed.
- 20 8. The method of claim 1, wherein the plasma pressure is between about 10 mTorr to 10 Torr.
9. The method of claim 1, wherein the plasma pressure is between about 100 mTorr and 1
Torr.
10. The method of claim 1, wherein the SRP is provided between high aspect ratio (HAR)
structures.
- 25 11. The method of claim 1, wherein the SRP is provided as a protective coating on substrate.
12. The method of claim 1, wherein the plasma is generated in an inductively coupled plasma
(ICP) source.
13. The method of claim 12, wherein the ICP source is separated from the substrate by a
showerhead or other filter.

14. The method of claim 1, wherein the plasma is generated in capacitively coupled plasma (CCP) source.
15. The method of claim 1, wherein exposing the substrate to a stimulus and exposing the substrate to the metastable atoms are performed in the same chamber.
- 5 16. A method comprising:
exposing a substrate to species from a plasma generated from a noble gas to remove residue from a stimulus responsive polymer removal process.