CLAIMS

1. A method of manufacture for an extreme ultraviolet reflective element comprising: providing a substrate; forming a multilayer stack on the substrate, the multilayer stack includes a plurality of reflective layer pairs having a first reflective layer and a second reflective layer for forming a Bragg reflector; and forming a capping layer on and over the multilayer stack, the capping layer formed from ruthenium tungsten, the capping layer protecting the multilayer stack by reducing oxidation and mechanical erosion.

2. The method as claimed in claim 1, wherein forming the multilayer stack includes forming the multilayer stack having the first reflective layer formed from silicon 4.1 nanometers thick and forming the second reflective layer from molybdenum 2.8 nanometers thick.

3. The method as claimed in claim 1, wherein forming the capping layer includes forming the capping layer using physical vapor deposition and forming the capping layer having a thickness between 20 angstroms and 50 angstroms and the capping layer transparent to extreme ultraviolet light.

4. The method as claimed in claim 1, wherein forming the capping layer includes forming the capping layer having a Mohs hardness of 5.5 or greater.

5. The method as claimed in claim 1, further comprising forming an absorber layer on and over the capping layer, the absorber layer formed from chromium nitride, tantalum nitride, nitrides, nickel, or a combination thereof.

6. The method as claimed in claim 1, wherein forming the capping layer includes forming the capping layer having a surface roughness of less than 0.2 nanometers root mean square (RMS).

7. An extreme ultraviolet reflective element comprising: a substrate; a multilayer stack on the substrate, the multilayer stack includes a plurality of reflective layer pairs having a first reflective layer and a second reflective layer; and a capping layer on and over the multilayer stack, the capping layer formed from ruthenium tungsten, the capping layer protecting the multilayer stack by reducing oxidation and mechanical erosion.

8. The extreme ultraviolet reflective element as claimed in claim 7, wherein the multilayer stack includes the first reflective layer formed from silicon 4.1 nanometers thick and the second reflective layer from molybdenum 2.8 nanometers thick.

9. The extreme ultraviolet reflective element as claimed in claim 7, wherein the capping layer has the characteristics of being formed by physical vapor deposition, has a thickness between 20 angstroms and 50 angstroms, and the capping layer transparent to extreme ultraviolet light.

10. The extreme ultraviolet reflective element as claimed in claim 7, wherein the capping layer has a Mohs hardness of 5.5 or greater.

11. The extreme ultraviolet reflective element as claimed in claim 7, further comprising an absorber layer on and over the capping layer, the absorber layer formed from chromium nitride, tantalum nitride, nitrides, nickel, or a combination thereof.

12. The extreme ultraviolet reflective element as claimed in claim 7, wherein the capping layer has a surface roughness of less than 0.2 nanometers root mean square (RMS).

13. An extreme ultraviolet reflective element lithography system comprising: an extreme ultraviolet light source which produces extreme ultraviolet light; a reflective element that can reflect the extreme ultraviolet light, the reflective element including a multilayer stack on a substrate, the multilayer stack includes a plurality of reflective layer pairs having a first reflective layer and a second reflective layer; and a capping layer on the multilayer stack, the capping layer formed from ruthenium tungsten.

14. The extreme ultraviolet reflective element lithography system as claimed in claim 13, wherein the first reflective layer is formed from silicon 4.1 nanometers thick and the second reflective layer from molybdenum 2.8 nanometers thick.

15. The extreme ultraviolet reflective element lithography system as claimed in claim 13, wherein the capping layer has a thickness between 20 angstroms and 50 angstroms, and the capping layer is transparent to extreme ultraviolet light.

16. The extreme ultraviolet reflective element lithography system as claimed in claim 13, wherein the capping layer has a Mohs hardness of 5.5 or greater.

17. The extreme ultraviolet reflective element lithography system as claimed in claim 13, wherein the capping layer has a surface roughness of less than 0.2 nanometers root mean square (RMS).