CLAIMS

1. A method of manufacturing a semiconductor device comprising:

directing extreme ultraviolet (EUV) light from an EUV light source through a reflective lens system;

interposing an EUV mask in the reflective lens system, the EUV mask having a substrate and a multi-layer stack forming a Bragg reflector, the multi-layer stack and the substrate having a thermally conducting smooth substrate with a predetermined substrate flatness of 0.5 nanometer (nm) RMS (root-mean-square) or less held on a surface of a chuck being thermally conducting and smooth having a predetermined chuck flatness; and

reflecting a pattern of the EUV mask on a semiconductor substrate for forming the semiconductor device, wherein interposing the EUV mask held on the surface of the chuck includes interposing the EUV mask held on the surface of the chuck having a textured mounting surface, wherein the textured mounting surface has mesas, grooves, holes, or a combination thereof.

2. The method as claimed in claim 1, wherein interposing the EUV mask having the substrate includes interposing the EUV mask having a specialized thin rigid material substrate, a silicon wafer, or a metallic substrate.

3. The method as claimed in claim 1, wherein interposing the EUV mask includes holding the EUV mask electrostatically on the surface of the chuck with a combined thickness of the chuck and the mask is 1 mm or less and the surface of the chuck has a predetermined chuck flatness of 3 nm RMS or less.

4. The method as claimed in claim 1, wherein interposing the EUV mask held on the surface of the chuck includes interposing the EUV mask held on the surface of the chuck having a cooling system using a gas or liquid coolant close to the EUV mask, at an operating temperature range of 100 degrees Centigrade of lower.

5. The method as claimed in claim 1, wherein the textured mounting surface reduces particle contamination.

6. The method as claimed in claim 1, wherein the textured mounting surface reduces distortion of the mask caused by the heat.

7. The method as claimed in claim 1, wherein the EUV mask has of 154 mm x 154 mm or greater.

8. The method as claimed in claim 1, wherein the predetermined substrate flatness is 0.5 nanometer root-mean-square or less when held on the surface of the chuck.

9. The method as claimed in claim 8, wherein the substrate is a metallic substrate.

10. The method as claimed in claim 1, wherein the substrate is a metallic substrate.

11. The method of claim 1, wherein the substrate has a thermal conductivity of 50 $W \cdot m^{-1} \cdot K^{-1}$.

12. The method of claim 1, wherein the textured mounting surface has mesas.

13. The method of claim 1, wherein the textured mounting surface has grooves.

14. The method of claim 1, wherein the textured mounting surface has holes.