CLAIMS

1. An extreme ultraviolet (EUV) mask blank comprising a:

a multilayer stack of reflective layers on a substrate, the multilayer stack of reflective layers including a plurality of reflective layers including reflective layer pairs of a first layer of material A and a second layer of material B and graded interfacial layers between the first layer of material A and the second layer of material B, the graded interfacial layers comprising the first material A and the second material B, wherein the graded interfacial layers have a thickness, and the graded interfacial layers comprise a density gradient across the thickness, wherein the first layer of material A comprises molybdenum (Mo) and the second layer of material B comprises silicon (Si), wherein the reflective layer pair reflects EUV radiation, the EUV mask blank further comprising a capping layer on the multilayer stack of reflective layers, and the capping layer has a surface having a roughness of 0.08 nm RMS or less for a length in a range of 1/100 nm and 1/1 μm.

2. The extreme ultraviolet (EUV) mask blank of claim 1, wherein each of the graded interfacial layers comprises a composition gradient across the thickness.

3. The extreme ultraviolet (EUV) mask blank of claim 1, wherein the graded interfacial layers comprise $MoSi_x$.

4. The extreme ultraviolet (EUV) mask blank of claim 1, further comprising an absorber layer on the capping layer.

5. The extreme ultraviolet (EUV) mask blank of claim 4, wherein the graded interfacial layers increase the reflectance of the multilayer stack of reflective layers by greater than or equal to 2% versus a comparable multilayer stack of reflective layers that does not comprise graded interfacial layers.

6. The EUV mask blank of claim 3, wherein where x is a number from 0 to 2.

7. The EUV mask blank of claim 6, wherein the graded interfacial layers have a first region rich in Mo adjacent to the first layer and a second region rich in Si adjacent to the second layer.