Claims

1. A conductive film coated substrate comprising:

a substrate for a mask blank for use in lithography; and

a conductive film formed on one main surface of the substrate;

wherein, in a frequency distribution chart where a relationship between a bearing depth obtained by measuring, with an atomic force microscope, a region of 1 μm x 1 μm of a surface of the conductive film and a frequency (%) of the bearing depth is plotted, an absolute value of a bearing depth corresponding to a center of a full width at half maximum, which is determined from an approximated curve drawn through the plotted points or a highest frequency of the plotted points, is equal to or larger than an absolute value of the bearing depth corresponding to 1/2 of a maximum height (Rmax) of surface roughness of the surface of the conductive film, and the maximum height (Rmax) is 1.3 nm or more and 15 nm or less.

2. A conductive film coated substrate according to claim 1, wherein a root means square roughness (Rms) of surface roughness of the surface of the conductive film is 0.15 nm or more and 1.0 nm or less.

3. A conductive film coated substrate according to claim 1 or 2, wherein the region of 1 μm x 1 μm of the surface of the conductive film is in an arbitrary location in a region of 148 mm x 148 mm.

4. A multilayer reflective film coated substrate comprising a multilayer reflective film formed by alternately laminating a high refractive index layer and a low refractive index layer, wherein the multilayer reflective film is formed on a main surface of the conductive film coated substrate according to claim 1 or 2 on a side opposite to a side on which the conductive film is formed.

5. A multilayer reflective film coated substrate according to claim 4, further comprising a protective film formed on the multilayer reflective film.

6. A reflective mask blank comprising an absorber film formed on the multilayer reflective film or the protective film of the multilayer reflective film coated substrate according to claim 4 or 5.

7. A reflective mask comprising an absorber pattern provided on the multilayer reflective film, wherein the absorber pattern is formed by patterning the absorber film of the reflective mask blank according to claim 6.

8. A method of manufacturing a semiconductor device, comprising a step of performing a lithography process with the reflective mask according to claim 7 using an exposure apparatus to form a transfer pattern on a transfer target.

Claims

1. A conductive film coated substrate comprising:

a substrate for a mask blank for use in lithography; and

a conductive film formed on one main surface of the substrate;

wherein, in a frequency distribution chart where a relationship between a bearing depth obtained by measuring, with an atomic force microscope, a region of 1 μm×1 μm of a surface of the conductive film and a frequency (%) of the bearing depth is plotted, an absolute value of a bearing depth corresponding to a center of a full width at half maximum, which is determined from an approximated curve drawn through the plotted points or a highest frequency of the plotted points, is equal to or larger than an absolute value of the bearing depth corresponding to 1⁄2 of a maximum height (Rmax) of surface roughness of the surface of the conductive film, and the maximum height (Rmax) is 1.3 nm or more and 15 nm or less.

2. A conductive film coated substrate according to claim 1, wherein a root means square roughness (Rms) of surface roughness of the surface of the conductive film is 0.15 nm or more and 1.0 nm or less.

3. A conductive film coated substrate according to claim 1, wherein the region of 1 μm×1 μm of the surface of the conductive film is in an arbitrary location in a region of 148 mm×148 mm.

4. A multilayer reflective film coated substrate comprising a multilayer reflective film formed by alternately laminating a high refractive index layer and a low refractive index layer, wherein the multilayer reflective film is formed on a main surface of the conductive film coated substrate according to claim 1 on a side opposite to a side on which the conductive film is formed.

5. A multilayer reflective film coated substrate according to claim 4, further comprising a protective film formed on the multilayer reflective film.

6. A reflective mask blank comprising an absorber film formed on the multilayer reflective film of the multilayer reflective film coated substrate according to claim 4.

7. A reflective mask blank comprising an absorber film formed on the protective film of the multilayer reflective film coated substrate according to claim 5.

8. A reflective mask comprising an absorber pattern provided on the multilayer reflective film, wherein the absorber pattern is formed by patterning the absorber film of the reflective mask blank according to claim 6.

9. A reflective mask comprising an absorber pattern provided on the multilayer reflective film, wherein the absorber pattern is formed by patterning the absorber film of the reflective mask blank according to claim 7.

10. A method of manufacturing a semiconductor device, comprising a step of performing a lithography process with the reflective mask according to claim 8 using an exposure apparatus to form a transfer pattern on a transfer target.

11. A method of manufacturing a semiconductor device, comprising a step of performing a lithography process with the reflective mask according to claim 9 using an exposure apparatus to form a transfer pattern on a transfer target.