CLAIMS

1. A substrate with a thin film comprising a thin film on at least one of two main surfaces of the substrate, wherein

the thin film comprises chromium and nitrogen,

when a diffracted X-ray intensity with respect to a diffraction angle 2θ is measured by an X-ray diffraction method using a CuK_α ray for the thin film, a peak is detected in a range where the diffraction angle 2θ is 56 degrees or more and 60 degrees or less.

2. The substrate with a thin film according to claim 1, wherein the thin film has a peak detected in a range where the diffraction angle 2θ is 41 degrees or more and 47 degrees or less.

3. The substrate with a thin film according to claim 1 or 2, wherein the thin film has no peak detected in a range where the diffraction angle 2θ is 35 degrees or more and 38 degrees or less.

4. The substrate with a thin film according to any one of claims 1 to 3, wherein the thin film further comprises nitrogen.

5. A substrate with a multilayer reflective film comprising a multilayer reflective film on one of two main surfaces of the substrate, wherein

the substrate comprises a back film on the other main surface of the substrate,

the back film comprises chromium and nitrogen, and

when a diffracted X-ray intensity with respect to a diffraction angle 2θ is measured by an X-ray diffraction method using a CuK_α ray for the back film, a peak is detected in a range where the diffraction angle 2θ is 56 degrees or more and 60 degrees or less.

6. The substrate with a multilayer reflective film according to claim 5, wherein the back film has a peak detected in a range where the diffraction angle 2θ is 41 degrees or more and 47 degrees or less.

7. The substrate with a multilayer reflective film according to claim 5 or 6, wherein the back film has no peak detected in a range where the diffraction angle 2θ is 35 degrees or more and 38 degrees or less.

8. The substrate with a multilayer reflective film according to any one of claims 5 to 7, wherein the back film further comprises nitrogen.

9. A reflective mask blank comprising a structure in which a multilayer reflective film and a pattern forming thin film are layered in this order on one of two main surfaces of the substrate, wherein

the substrate comprises a back film on the other main surface of the substrate,

the back film comprises chromium and nitrogen, and

when a diffracted X-ray intensity with respect to a diffraction angle 2θ is measured by an X-ray diffraction method using a CuK_α ray for the back film, a peak is detected in a range where the diffraction angle 2θ is 56 degrees or more and 60 degrees or less.

10. The reflective mask blank according to claim 9, wherein the back film has a peak detected in a range where the diffraction angle 2θ is 41 degrees or more and 47 degrees or less.

11. The reflective mask blank according to claim 9 or 10, wherein the back film has no peak detected in a range where the diffraction angle 2θ is 35 degrees or more and 38 degrees or less.

12. The reflective mask blank according to any one of claims 9 to 11, wherein the back film further comprises nitrogen.

13. A reflective mask comprising a transfer pattern formed on the pattern forming thin film of the reflective mask blank according to any one of claims 9 to 12.

14. A method for manufacturing a semiconductor device, the method comprising exposing and transferring a transfer pattern onto a resist film on a semiconductor substrate using the reflective mask according to claim 13.