

ABSTRACT

Provided are a substrate with a multilayer reflective film, a reflective mask blank, a method for manufacturing a reflective mask, and a method for manufacturing a semiconductor device capable of preventing film peeling of a multilayer reflective film due to cleaning or the like during a mask manufacturing process and use of a mask, and reducing occurrence of defects on an absorber film due to the film peeling of the multilayer reflective film.

A substrate with a multilayer reflective film 100 comprises a substrate 10 and a multilayer reflective film 12 formed on a main surface of the substrate 10. The multilayer reflective film 12 comprises a structure in which a high refractive index layer and a low refractive index layer are alternately layered. The high refractive index layer is formed of a material comprising Si. The low refractive index layer is formed of a material comprising a transition metal. An outermost periphery 60 of the multilayer reflective film 12 is formed of a compound comprising Si and a transition metal. A ratio of the content (atomic%) of Si to the total content (atomic%) of Si and the transition metal in the comprising is 0.50 or less.