

PHASE SHIFT MASK BLANK, METHOD FOR PRODUCING PHASE SHIFT
MASK, AND PHASE SHIFT MASK

ABSTRACT

Phase shift mask blank having a transparent substrate and a phase shift film formed on the substrate, comprising, the phase shift film has a phase difference of 160 to 200° and a transmittance of 3 to 15% at exposure wavelength of 200 nm or less, the phase shift film includes a lower layer and an upper layer in order from the transparent substrate side, the upper layer contains transition metal, silicon, nitrogen and/or oxygen, or silicon, nitrogen and/or oxygen, the lower layer contains chromium, silicon, nitrogen and/or oxygen, and the content of silicon is 3% or more to less than 15% for the sum of chromium and silicon in the lower layer, and the ratio of oxygen content to the total content of chromium and silicon is less than 1.7, and etching selectivity of the upper layer is 10 or more compared to the lower layer in fluorine-based dry etching.

FIG. 1