electron beam lithography, recently, the accelerating voltage of the electron beam (EB) is increased to reduce the effect of electron scattering (forward scattering) in the resist film. However, in this case, the resist film is reduced in the electron energy trapping ratio to decrease the sensitivity, and the effect of scattering (back scattering) of electrons reflected in the resist substrate increases. In particular, when forming an isolated pattern having a large exposure area, the effect of back scattering is large, and the resolution of the isolated pattern is impaired.

Particularly, in the case of patterning on a photomask blanks used for semiconductor exposure, a light-shielding film containing a heavy atom is present as the layer below the resist, and the effect of backward scattering attributable to the heavy atom is serious. Therefore, in the case of forming an isolated pattern on a photomask blanks, among others, the resolution is highly likely to decrease.

As one of the methods to solve these problems, use of a resin having a polycyclic aromatic skeleton such as naphthalene is being studied (see, for example, JP-A-2008-95009 and JP-A-2009-86354), but the problem about the resolution of an isolated pattern has been unsolved. In JP-A-2005-99558, as one of the methods to enhance the resolution of an isolated pattern, a resin containing a group for adjusting the solubility is used, but it has not been achieved to sufficiently satisfy the resolution of an isolated pattern.

Also, the microfabrication using a resist composition is not only used directly to produce an integrated circuit but also applied, in recent year, to the fabrication or the like of a so-called imprint mold structure (see, for example, JP-A-2008-162101 and Yoshihiko Hirai (compiler), Nanoimprint no Kiso to Gijutsu Kaihatsu•Oyo Tenkai - Nanoimprint no Kiban Gijutsu to Saishin no Gijutsu Tenkai (Basic and Technology Expansion•Application Development of Nanoimprint - Fundamental Technology of Nanoimprint and Latest Technology Expansion), Frontier Shuppan (issued June, 2006)). Therefore, it becomes an important task to satisfy high sensitivity, high resolution property (for example, high resolution, excellent pattern profile and small line edge roughness (LER)) and good dry etching resistance all at the same time, and this needs to be solved.

Summary ~~of Invention~~

An object of the present disclosure~~invention~~ is to provide a chemical amplification resist composition capable of forming a pattern satisfying high sensitivity, high resolution property

(for example, high resolution, excellent pattern profile and small line edge roughness (LER)) and good dry etching resistance all at the same time, and a resist film using the composition, a resist-coated mask blanks, a resist pattern forming method, a photomask and a polymer compound.

Another object of the present disclosure~~invention~~ is to provide a chemical amplification resist composition exhibiting high resolution particularly in forming a fine isolated pattern by exposure to an electron beam or an extreme-ultraviolet ray.

As a result of intensive studies, the present inventors have found that the above-described objects can be attained by a chemical amplification resist composition containing a polymer compound of specific structure.

In an aspect, there is provided a chemical amplification resist composition, comprising: (A) a polymer compound having a structure when a hydrogen atom of a phenolic hydroxyl group is replaced by a group having a non-acid-decomposable polycyclic alicyclic hydrocarbon structure; (B) a compound capable of generating an acid upon irradiation with an actinic ray or radiation; and (C) a crosslinking agent.

In another aspect, there is provided a resist film, which is formed from the chemical amplification resist composition as defined herein.

In another aspect, there is provided a resist-coated mask blanks, which is coated with the resist film as defined herein.

In another aspect, there is provided a resist pattern forming method, comprising: exposing the resist film as defined herein; and developing the exposed film.

In another aspect, there is provided a resist pattern forming method, comprising: exposing the resist-coated mask blanks as defined herein; and developing the exposed resist-coated mask blanks.

In another aspect, there is provided a photomask, which is obtained by exposing and developing the resist-coated mask blanks as defined herein.

~~That is, t~~The present disclosure~~invention~~ ~~provides~~is as follows.

[1]

A chemical amplification resist composition, comprising:

(A) a polymer compound having a structure where a hydrogen atom of a phenolic hydroxyl group is replaced by a group having a non-acid-decomposable polycyclic alicyclic hydrocarbon structure; and

(B) a compound capable of generating an acid upon irradiation with an actinic ray or radiation.

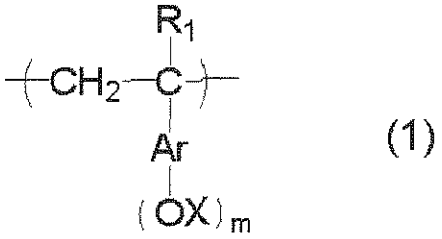
[2]

The chemical amplification resist composition as described in [1] above, which is for electron beam or extreme-ultraviolet exposure.

[3]

The chemical amplification resist composition as described in [1] or [2] above,

wherein the polymer compound (A) contains a repeating unit represented by the following formula (1):



(1)

wherein $R_1$ represents a hydrogen atom or a methyl group;

X represents a group having a non-acid-decomposable polycyclic alicyclic hydrocarbon structure;