the present invention, and the pattern forming method of the embodiment of the present invention include no impurities such as metal components, isomers, and residual monomers. The content of the impurities included in these materials is preferably 1 ppm or less, more preferably 100 ppt or less, and still more preferably 10 ppt or less, and particularly preferably, the impurities are not substantially included (no higher than a detection limit of a measurement device).

[0563] Examples of a method for removing impurities such as metals from the various materials include filtration using a filter. As for the filter pore diameter, the pore size is preferably 10 nm or less, more preferably 5 nm or less, and still more preferably 3 nm or less. As for the materials of a filter, a polytetrafluoroethylene-made, polyethylene-made, or nylon-made filter is preferable. As the filter, a filter which has been washed with an organic solvent in advance may be used. In the step of filtration using a filter, plural kinds of filters connected in series or in parallel may be used. In a case of using the plural kinds of filters, a combination of filters having different pore diameters and/or materials may be used. In addition, various materials may be filtered plural times, and the step of filtering plural times may be a circulatory filtration step. As the filter, a filter having a reduced amount of eluates as disclosed in the specification of JP2016-201426A is preferable.

[0564] In addition to the filtration using a filter, removal of impurities by an adsorbing material may be performed, or a combination of filtration using a filter and an adsorbing material may be used. As the adsorbing material, known adsorbing materials can be used, and for example, inorganic adsorbing materials such as silica gel and zeolite, and organic adsorbing materials such as activated carbon can be used. Examples of the metal adsorbing agent include those disclosed in the specification of JP2016-206500A.

[0565] In addition, as a method for reducing the impurities such as metals included in the various materials, metal content selects the less material as a raw material constituting the various materials, performing filtering using a filter of the raw material constituting the various materials, equipment the inner and a method such as performing distillation under conditions suppressing as much where available equal to contamination is lined with TEFLON (registered trademark). It is also preferable to perform a glass lining treatment in all steps of the manufacturing facility for synthesizing various materials (a resin, a photoacid generator, and the like) of the resist component in order to reduce impurities such as metals to a ppt order. Preferred conditions in the filtering using a filter to be performed on the raw material constituting the various materials are the same as the above-described conditions.

[0566] In order to prevent impurities from being incorporated, it is preferable that various materials are stored in the container described in US2015/0227049A, JP2015-123351A, JP2017-013804A, or the like.

[0567] A method for improving the surface roughness of a pattern may be applied to a pattern formed by the pattern forming method of the embodiment of the present invention. Examples of the method for improving the surface roughness of a pattern include the method of treating a pattern by plasma of a hydrogen-containing gas, as disclosed in the specification of US2015/0104957A. In addition, known methods as described in the specification of JP2004-235468A, the specification of US2010/0020297A, and Proc. of SPIE Vol. 8328 83280N-1 "EUV Resist Curing Technique for LWR Reduction and Etch Selectivity Enhancement" may be applied.

[0568] In addition, a pattern formed by the method can be used as a core material (core) of the spacer process disclosed in, for example, the specification of JP1991-270227A (JP-H03-270227A) and the specification of US2013/0209941A.

[0569] [Method for Manufacturing Electronic Device]

[0570] Moreover, the present invention further relates to a method for manufacturing an electronic device, the method including the above-described pattern forming method. The electronic device manufactured by the method for manufacturing an electronic device of an embodiment of the present invention is suitably mounted on electric or electronic equipment (for example, home electronics, office automation (OA)-related equipment, media-related equipment, optical equipment, and telecommunication equipment).

EXAMPLES

[0571] Hereinbelow, the present invention will be described in more detail with reference to Examples. The materials, the amounts of materials used, the proportions, the treatment details, the treatment procedure, and the like shown in the Examples below may be modified as appropriate as long as the modifications do not depart from the spirit of the present invention. Therefore, the scope of the present invention should not be construed as being limited to the Examples shown below.

[0572] [Preparation of Actinic Ray-Sensitive or Radiation-Sensitive Resin Composition (for ArF Exposure)]

[0573] Various components contained in the actinic ray-sensitive or radiation-sensitive resin composition shown in Table 4 are shown below.

[0574] <Resin (AX1)>

[0575] The resins (A-1 to A-11 and B-1 to B-3) shown in Table 4 are shown below.

[0576] Further, the weight-average molecular weight (Mw) and the dispersity (Mw/Mn) of the resins A-1 to A-11 and B-1 to B-3 were measured by GPC (carrier: THF (tetrahydrofuran)) (amount converted in terms of polystyrene). In addition, the compositional ratio (ratio % by mole) of the resin was measured by ^{13}C-nuclear magnetic resonance (NMR).

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