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#### (54) CHEMICALLY AMPLIFIED NEGATIVE RESIST COMPOSITION AND RESIST PATTERN FORMING PROCESS

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(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(52) U.S. Cl.

## (58) Field of Classification Search

CPC ..... G03F 7/0045; G03F 7/033; C07C 381/12; C07C 317/04; C07C 317/28; C07C 303/32 

#### (56) References Cited

#### U.S. PATENT DOCUMENTS

6,479,210	B2	11/2002	Kinoshita et al.
6,485,883	B2	11/2002	Kodama et al.
6,492,091	B2	12/2002	Kodama et al.
7,214,467	B2	5/2007	Kanna et al.
8,202,677	B2	6/2012	Takeda et al.
8,785,105	B2 *	7/2014	Ohsawa C07C 309/12
			430/270.1
9,075,306	B2	7/2015	Takeda et al.
9,233,919	B2 *	1/2016	Ohsawa C07C 309/12
9,250,518	B2 *	2/2016	Hatakeyama G03F 7/0046
10,173,975	B2 *	1/2019	Ohashi C08F 220/24
006/0166133	A1	7/2006	Koitabashi et al.
018/0180992	A1*	6/2018	Kotake G03F 7/0045

#### FOREIGN PATENT DOCUMENTS

EP	1684118	Α1	7/2006
EP	1975711	A1	10/2008
JP	11-327143	Α	11/1999
JP	2006-201532	Α	8/2006
JP	2006-215180	Α	8/2006
JP	3955384	B2	8/2007
JP	4116340	B2	7/2008
JP	2008-249762	Α	10/2008
JP	4226803	B2	2/2009
JP	4231622	B2	3/2009
JP	4575479	B2	11/2010

<sup>\*</sup> cited by examiner

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## (57) **ABSTRACT**

A negative resist composition comprising a sulfonium compound having formula (A) and a base polymer is provided. The resist composition exhibits a high resolution during pattern formation and forms a pattern with minimal LER.

$$(R^{1})_{p}$$

$$(R^{2})_{q}$$

$$(R^{3})_{r}$$