TABLE 1-continued

		Polymer (pbw)	Acid generator (pbw)	Quencher (pbw)	Water-repellent polymer (pbw)	Organic solvent (pbw)	PEB temp. (° C.)	Sensitivity (mJ/cm^2)	PPD size (nm)
	1-10	Polymer 1 (100)	PAG1 (8.0)	Quencher 10 (4.50)	Water-repellent polymer 1 (4.0)	PGMEA(2,200) GBL(300)	95	36	0.1
	1-11	Polymer 1 (100)	PAG2 (8.0)	Quencher 11 (4.50)	Water-repellent polymer 1 (4.0)	PGMEA(2,200) GBL(300)	95	39	0.4
	1-12	Polymer 2 (100)	—	Quencher 11 (4.50)	Water-repellent polymer 1 (4.0)	PGMEA(2,200) GBL(300)	100	36	0
	1-13	Polymer 3 (100)	PAG1 (8.0)	Quencher 11 (4.50)	Water-repellent polymer 1 (4.0)	PGMEA(2,200) GBL(300)	95	39	0.2
Comparative Example	1-1	Polymer 1 (100)	PAG1 (8.0)	Comparative Amine 1 (3.13)	Water-repellent polymer 1 (4.0)	PGMEA(2,200) GBL(300)	95	55	1.3
	1-2	Polymer 1 (100)	PAG1 (8.0)	Comparative Amine 2 (3.13)	Water-repellent polymer 1 (4.0)	PGMEA(2,200) GBL(300)	95	56	1.5
	1-3	Polymer 1 (100)	PAG1 (8.0)	Comparative Quencher 1 (4.50)	Water-repellent polymer 1 (4.0)	PGMEA(2,200) GBL(300)	95	45	0.8
	1-4	Polymer 1 (100)	PAG1 (8.0)	Comparative Quencher 2 (4.50)	Water-repellent polymer 1 (4.0)	PGMEA(2,200) GBL(300)	95	44	0.6

EB Writing Test

Examples 2-1 to 2-5 and Comparative Examples 2-1 to 2-2

Each of the resist compositions in Table 2 was spin coated onto a silicon substrate, which had been vapor primed with hexamethyldisilazane (HMDS), and pre-baked on a hot plate at 110° C. for 60 seconds to form a resist film of 80 nm thick. Using a system HL-800D (Hitachi Ltd.) at an accelerating voltage of 50 kV, the resist film was exposed imagewise to EB in a vacuum chamber. Immediately after the image writing, the resist film was baked (PEB) on a hot plate at 90° C. for 60 seconds and developed in a 2.38 wt % TMAH aqueous solution for 30 seconds to form a pattern. The resist pattern was evaluated as follows.

In the case of positive resist film, the resolution is a minimum trench size at the exposure dose that provides a resolution as designed of a 120-nm trench pattern. In the case of negative resist film, the resolution is a minimum isolated line size at the exposure dose that provides a resolution as designed of a 120-nm isolated line pattern. It is noted that Examples 2-1 to 2-4 and Comparative Examples 2-1 to 2-2 are positive resist compositions, and Example 2-5 is a negative resist composition.

The results are shown in Table 2.

TABLE 2

		Polymer (pbw)	Acid generator (pbw)	Quencher (pbw)	Organic solvent (pbw)	Sensitivity (μC/cm^2)	Resolution (nm)
Example	2-1	Polymer 4 (100)	—	Quencher 8 (2.50)	PGMEA(400) CyH(2,000) PGME(100)	33	80
	2-2	Polymer 4 (100)	—	Quencher 9 (2.50)	PGMEA(400) CyH(2,000) PGME(100)	35	80
	2-3	Polymer 4 (100)	—	Quencher 10 (2.50)	PGMEA(400) CyH(2,000) PGME(100)	35	80
	2-4	Polymer 5 (100)	PAG3 (15.0)	Quencher 12 (2.50)	PGMEA(400) CyH(1,600) CyP(500)	39	85
	2-5	Polymer 6 (100)	PAG1 (10.0)	Quencher 13 (2.50)	PGMEA(2,000) CyH(500)	38	75
Comparative Example	2-1	Polymer 4 (100)	—	Comparative Quencher 1 (2.50)	PGMEA(400) CyH(2,000) PGME(100)	38	90
	2-2	Polymer 4 (100)	—	Comparative Quencher 2 (2.50)	PGMEA(400) CyH(2,000) PGME(100)	38	90

It is demonstrated in Tables 1 and 2 that resist compositions comprising a sulfonium or iodonium salt of sulfonic acid containing a morpholino group offer dimensional stability on PPD and a satisfactory resolution.

Japanese Patent Application No. 2015-205402 is incorporated herein by reference.