

taken as the limiting pattern collapse line width and this is made as the indicator of pattern collapse performance. The smaller the value, the pattern is resolved without collapse of the finer pattern, that is, the pattern collapse performance is good. The results obtained are shown in Table 6. Incidentally, since Comparative Example 102 is positive development, when exposure amount is increased from the above Eop to make the line width thinner the minimum line width capable of resolution without causing pattern collapse is taken as the

[0986] Incidentally, taking the height of the resist pattern from the surface of the substrate (when the height of the resist pattern is not uniform, the maximum height of the resist pattern from the surface of the substrate) as T, the line width at the lower part of the pattern means the line width of the resist pattern at the height of 0.1×T from the surface of the substrate. The line width at the upper part of the pattern means the line width of the resist pattern at the height of 0.9×T from the surface of the substrate

TABLE 6

EB Exposure							
		Development		Rinsing	Results of Evaluation		
	Composition	Developer	Positive/ Negative	Rinsing Solution	Sensitivity ( $\mu\text{C}/\text{cm}^2$ )	Pattern Collapse (nm)	Pattern Form (bite)
Example No.							
101	Ra1	Butyl acetate	Negative	Decane	29.3	36.2	B
102	Ra2	Butyl acetate	Negative	—	37.3	35.0	A
103	Ra3	Butyl acetate	Negative	1-Hexanol	26.7	26.3	A
104	Ra4	Butyl acetate	Negative	2-Hexanol	17.3	33.5	B
105	Ra5	Butyl acetate	Negative	4-Methyl-2-pentanol	30.5	32.5	A
106	Ra6	Butyl acetate	Negative	Decane	23.2	34.3	A
107	Ra7	Butyl acetate	Negative	—	49.9	33.8	A
108	Ra8	Butyl acetate	Negative	1-Hexanol	43.8	30.0	A
109	Ra9	Butyl acetate	Negative	2-Hexanol	30.5	36.7	A
110	Ra10	Butyl acetate	Negative	4-Methyl-2-pentanol	24.9	33.6	A
111	Ra11	Butyl acetate	Negative	Decane	15.2	26.8	A
112	Ra12	Butyl acetate	Negative	—	18.7	35.0	B
113	Ra13	Butyl acetate	Negative	1-Hexanol	13.3	24.9	B
114	Ra14	Butyl acetate	Negative	2-Hexanol	14.7	28.5	A
115	Ra15	Butyl acetate	Negative	4-Methyl-2-pentanol	21.8	32.0	A
116	Ra16	Butyl acetate	Negative	Decane	34.7	37.5	A
117	Ra17	Butyl acetate	Negative	—	37.3	39.3	A
118	Ra18	Butyl acetate	Negative	1-Hexanol	30.0	30.7	A
119	Ra19	Butyl acetate	Negative	2-Hexanol	46.7	26.7	A
120	Ra20	Butyl acetate	Negative	4-Methyl-2-pentanol	22.0	29.7	A
121	Ra21	Methyl isobutyl ketone	Negative	—	31.5	33.0	A
122	Ra22	Amyl acetate/isopropanol (95/5)	Negative	1-Hexanol	68.0	41.7	B
123	Ra23	Butyl acetate-hexanol (7/3)	Negative	—	62.7	39.7	B
Comparative Example No.							
101	Rb1	Butyl acetate	Negative	Decane	213	43.5	B
102	Rb2	2.38% TMAH	Positive	Water	160	49.0	C

limiting pattern collapse line width and this is made as the indicator of pattern collapse performance.

<Evaluation of Pattern Form (Form of Bite at the Lower Part of the Pattern)>

[0985] In the above Eop, a 1/1 line and space pattern having a line width of 50 nm is observed with a scanning electron microscope (S4800, manufactured by Hitachi Limited). The case where bite at the lower part of the resist pattern is not observed and the line width at the lower part of the pattern is a line width of 101% or less and 99% or more of the line width at the upper part of the pattern is graded A, the case where although a slight bite is observed at the lower part of the resist pattern, the line width at the lower part of the pattern is a line width in the range of less than 99% and 90% or more of the line width at the upper part of the pattern is graded B, and the case where bite at the lower part of the resist pattern is observed and the line width at the lower part of the pattern is less than 90% of the line width at the upper part of the pattern is graded C. The results obtained are shown in Table 6.

[0987] As can be seen from the above table, Examples 101 to 123 achieve high sensitivity and are excellent in pattern collapse performance and are further excellent in the form not generating the bite at the lower part of the pattern as compared with Comparative Example 101 wherein the low molecular weight compound (B) according to the invention is not used and Comparative Example 102 wherein the positive pattern is formed with the alkali developer. That is, it is apparent that the invention is excellent in the above performances and a highly precise fine pattern can be stably formed in EB exposure according to the invention.

[0988] Further, in Examples 101 to 121 where the content of the acid generator to all the solids content of the composition is 21% by mass or more, further higher sensitivity can be achieved.

#### INDUSTRIAL APPLICABILITY

[0989] According to the invention, a pattern high in sensitivity, improved in pattern collapse, and having an excellent