

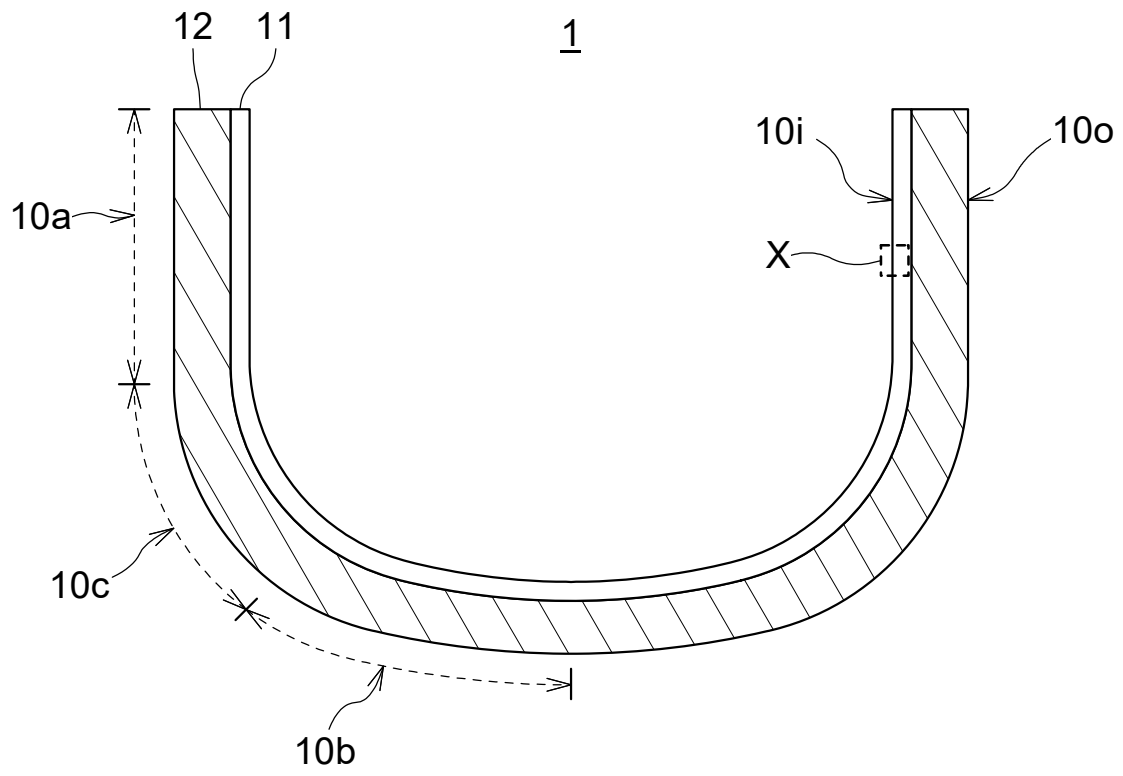


FIG.1

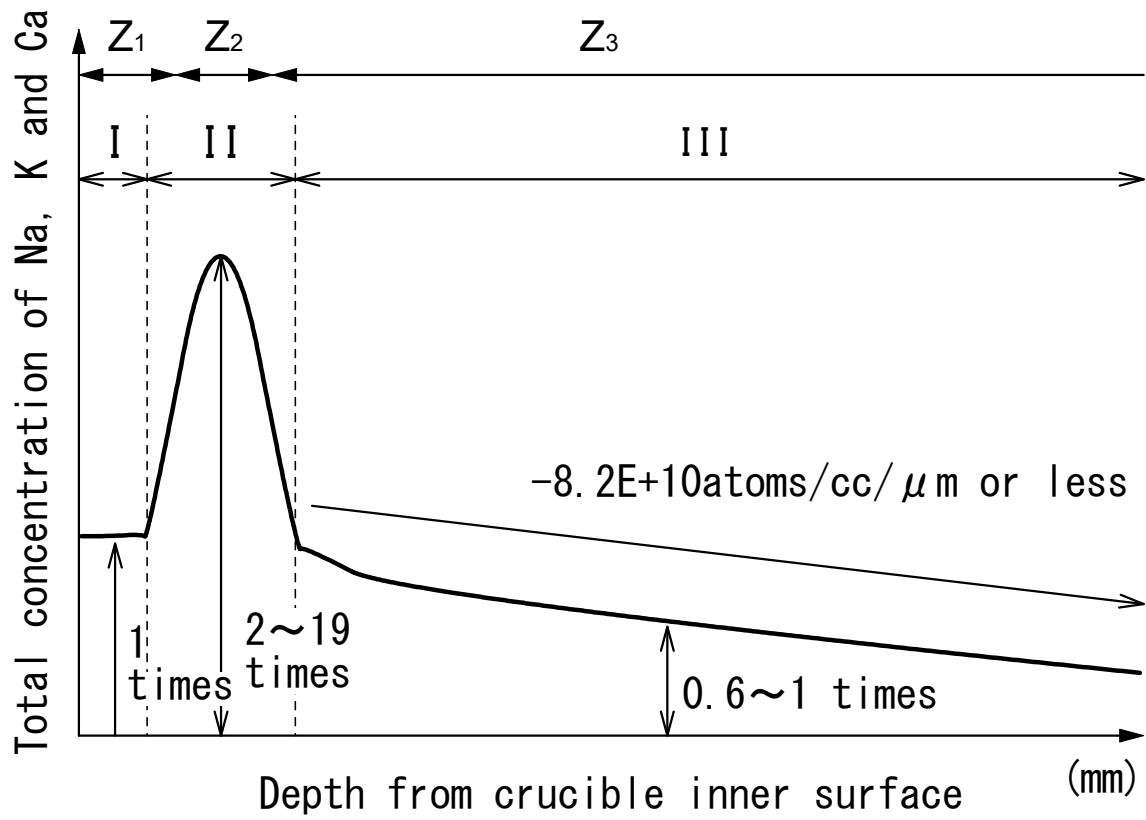


FIG.2

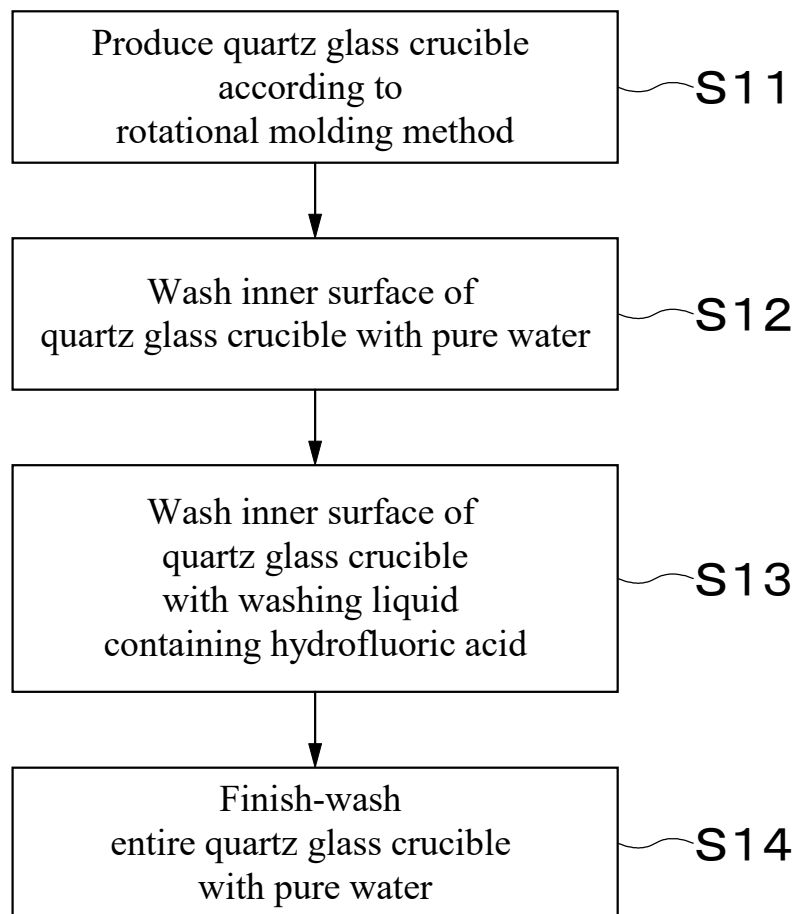


FIG.3

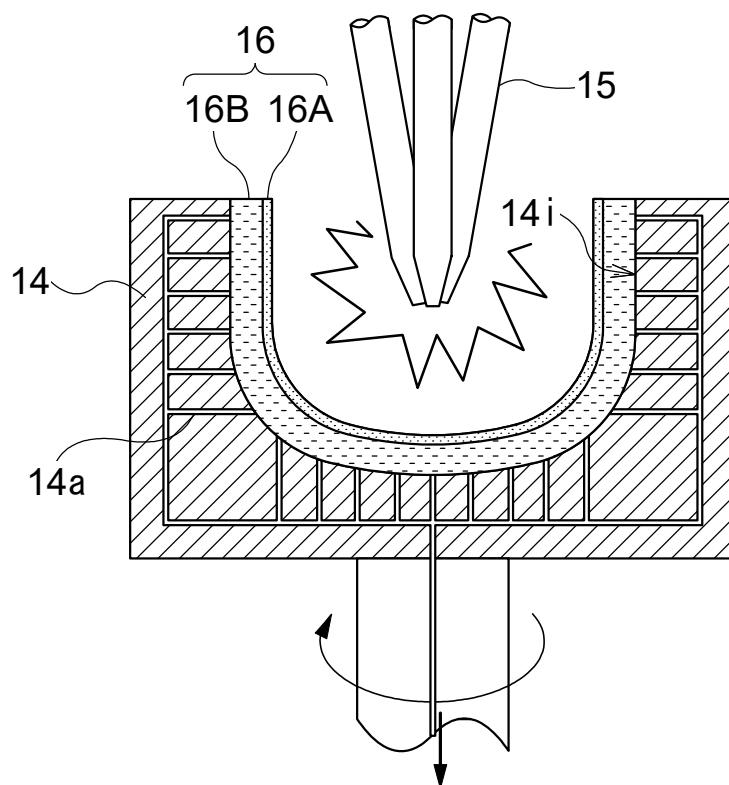
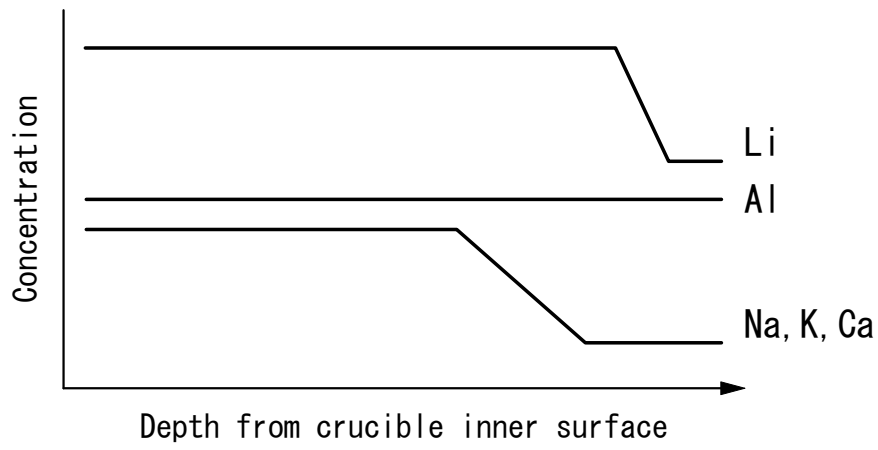
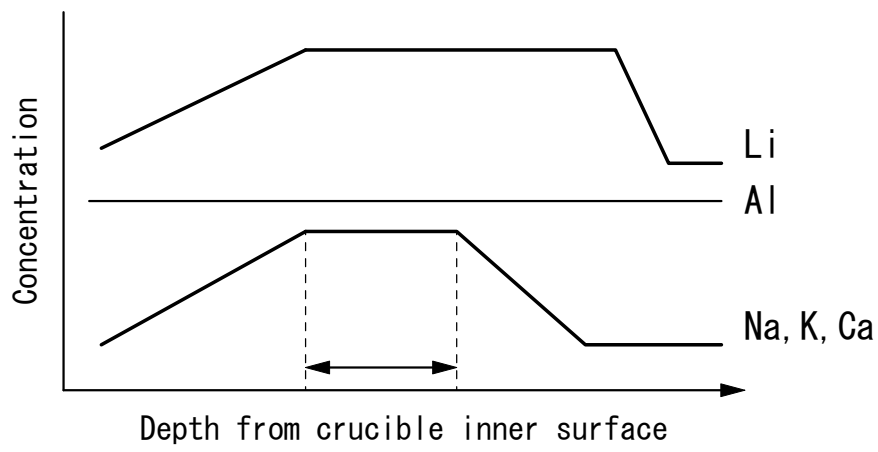


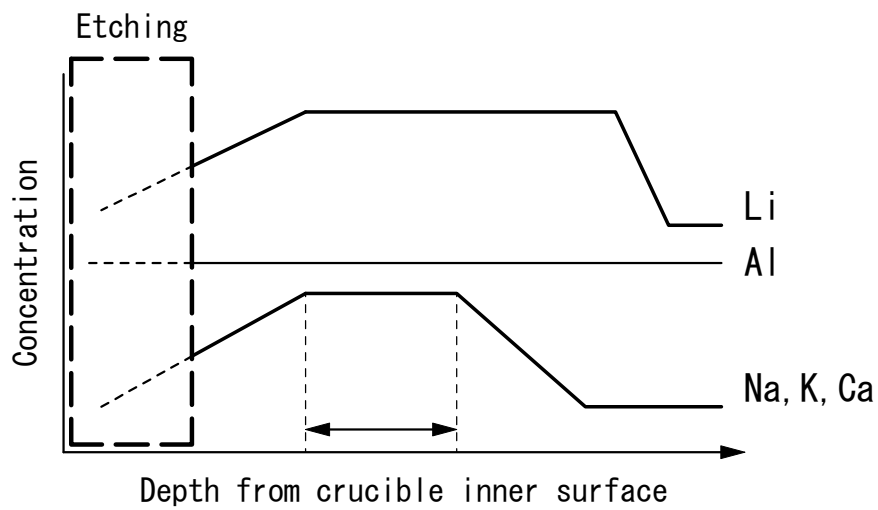
FIG.4



(a)



(b)



(c)

FIG.5

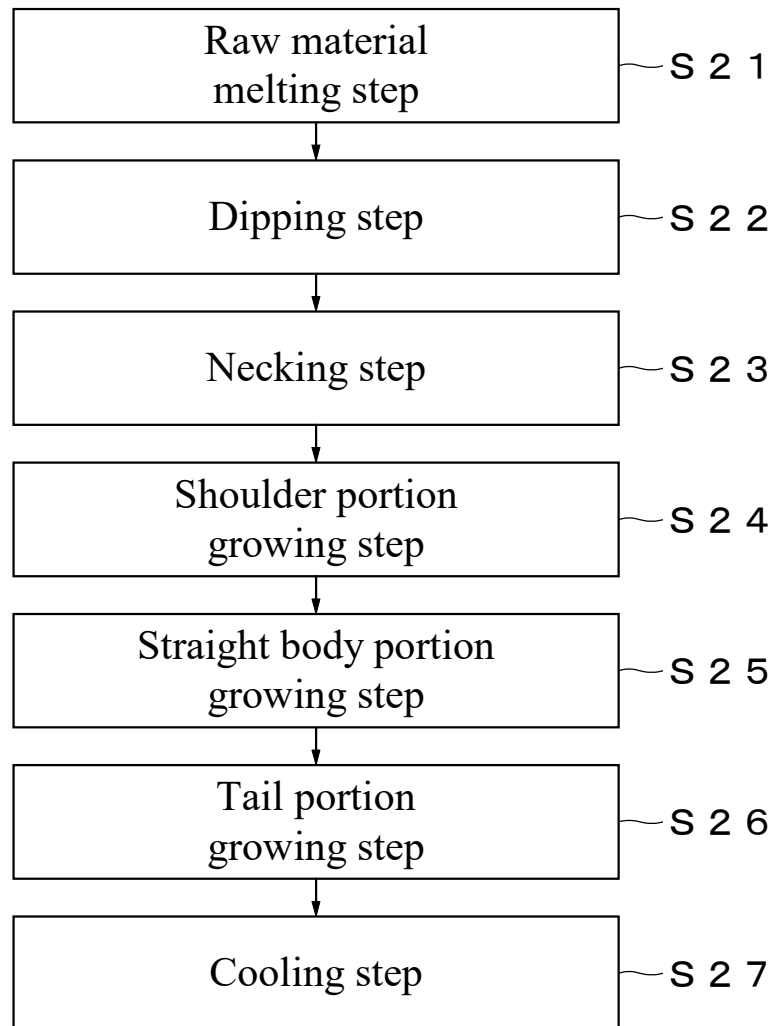


FIG.6

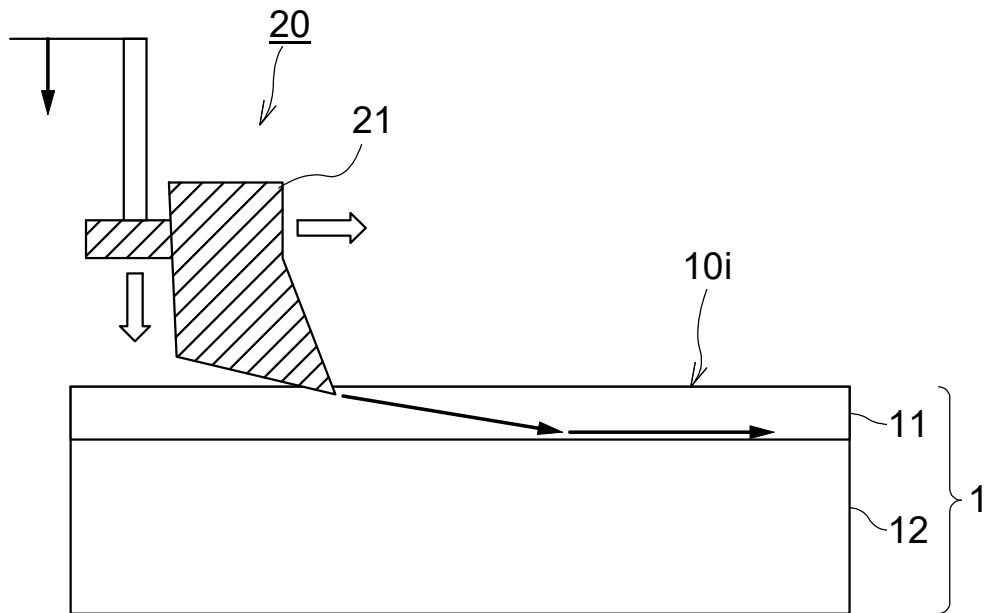
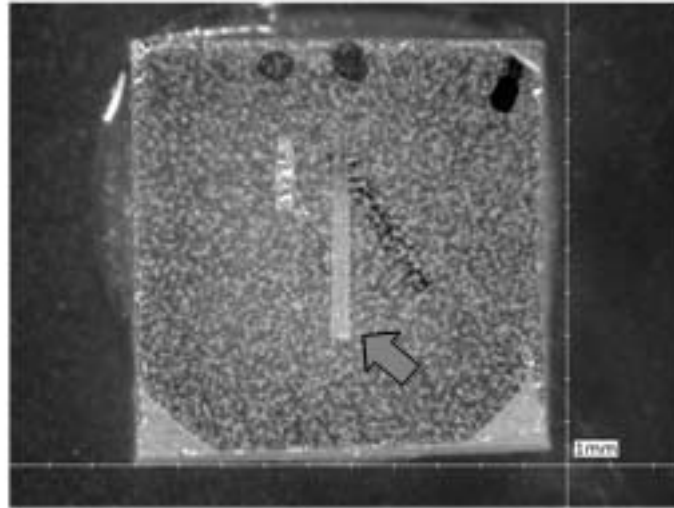
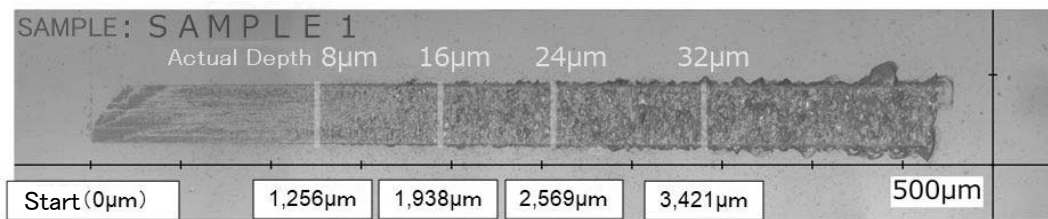


FIG.7

Cutting
Direction



(a)



(b)

FIG.8

Crucible sample	Quartz glass crucible							Result of silicon single crystal pulling-up	
	Total concentration of Na, K, and Ca				Arithmetic average roughness of outermost surface Ra (μm)	Outer appearance after use		Lag time (hr)	Single crystal yield (%)
	Concentration peak within range of 16 to 32 μm from inner surface	Concentration ratio [II/I]	Concentration ratio [III/I]	Concentration gradient [III] (atoms/cc/ μm)		Number density of brown rings (piece/ cm^2)	Peeling area Ratio (%)		
Ex 1 (A1)	Present	6	1.0	-5.6E + 11	0.02	1	0	No lag time	82.2
Ex 2 (A2)	Present	11	0.8	-2.6E + 11	0.03	2	0	No lag time	81.7
Ex 3 (A3)	Present	19	0.6	-8.6E + 11	0.02	1	0.8	No lag time	87.0
Ex 4 (A4)	Present	2	0.8	-8.5E + 10	0.02	1	8	No lag time	82.3
Comp Ex 1 (A5)	Absent	1	0.1	-2.9E + 10	0.03	5	26	15.3	35.1
Comp Ex 2 (A6)	Absent	1	0.1	-8.6E + 11	0.02	6	31	5.3	51.5
Comp Ex 3 (A7)	Absent	2	0.1	-5.9E + 10	0.04	2	42	No lag time	60.5
Comp Ex 4 (A8)	Absent	21	0.8	-4.3E + 10	0.05	1	36	2.9	45.9

FIG.9