Fig.1

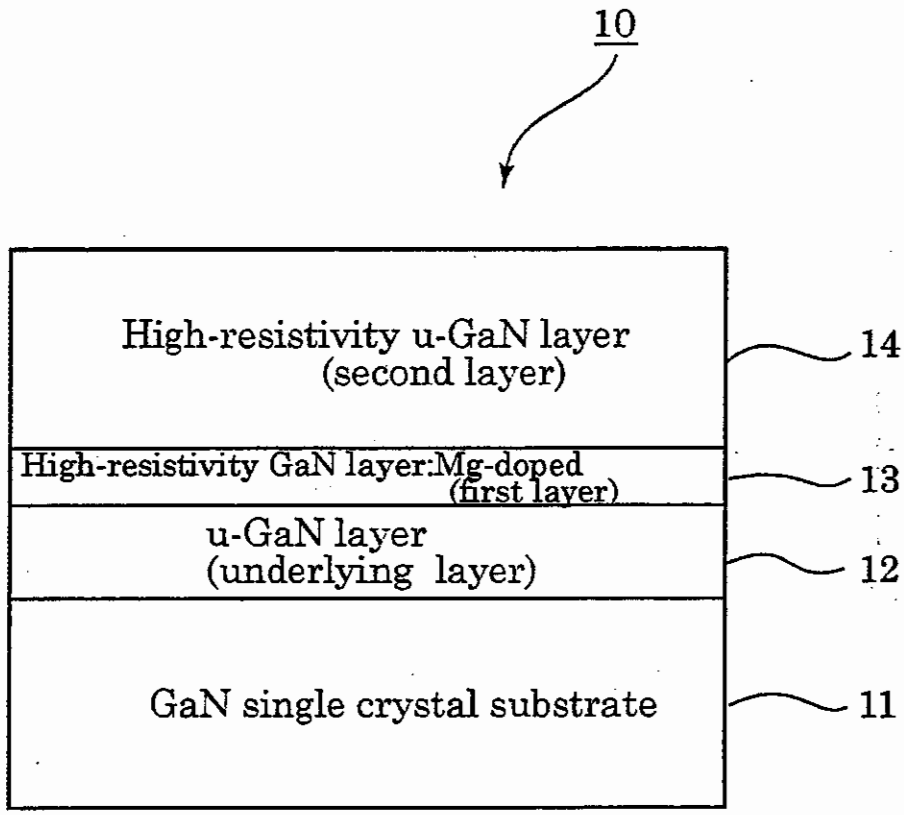

10
High-resistivity u-GaN layer
(second layer)
14
High-resistivity GaN layer:Mg-doped
(first layer)
13
u-GaN layer
(underlying layer)
12
GaN single crystal substrate
11

Fig.2

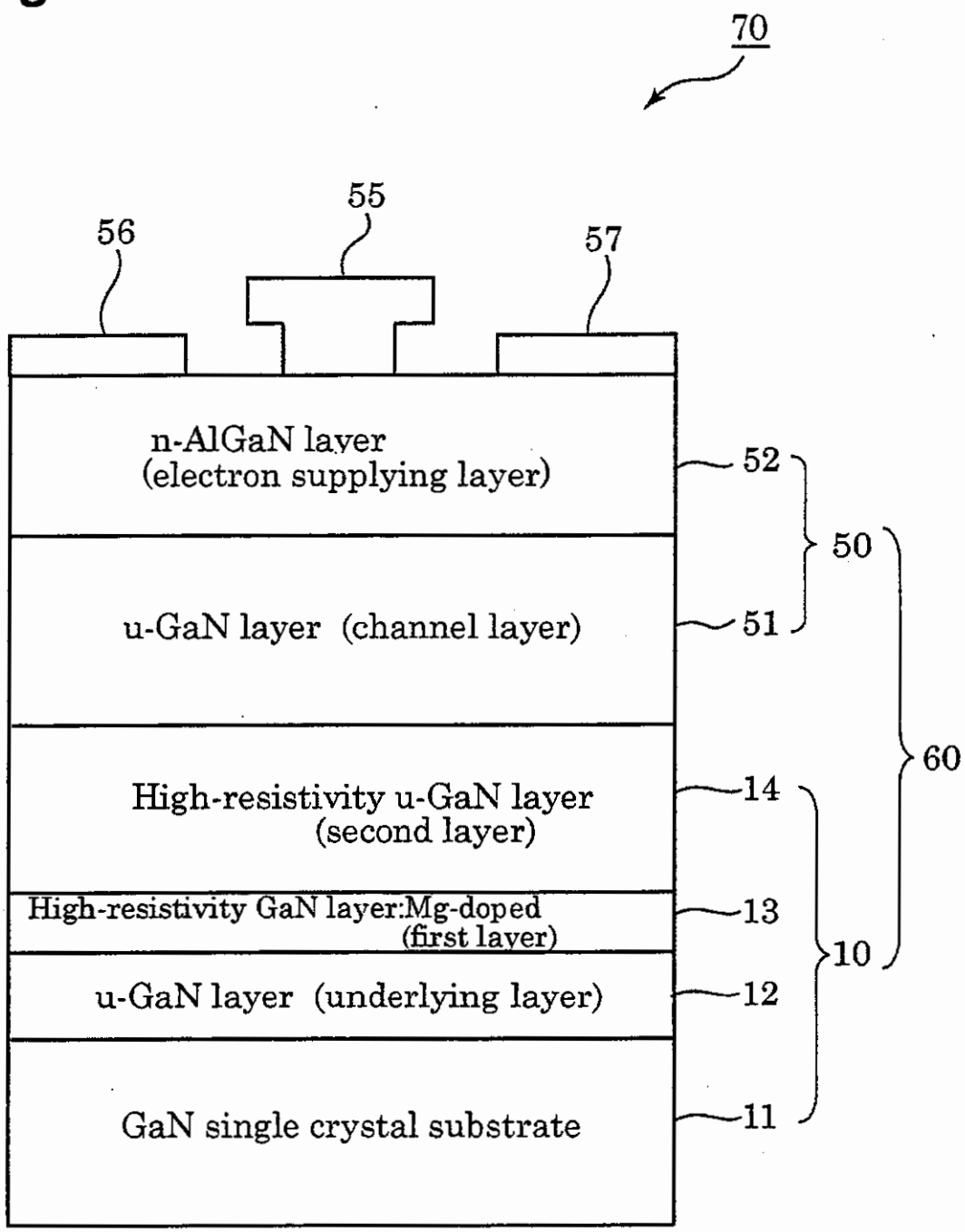

70
55
56
57
n-AlGaN layer
(electron supplying layer)
52
50
u-GaN layer (channel layer)
51
60
High-resistivity u-GaN layer
(second layer)
14
High-resistivity GaN layer:Mg-doped
(first layer)
13
10
u-GaN layer (underlying layer)
12
GaN single crystal substrate
11

Fig.3

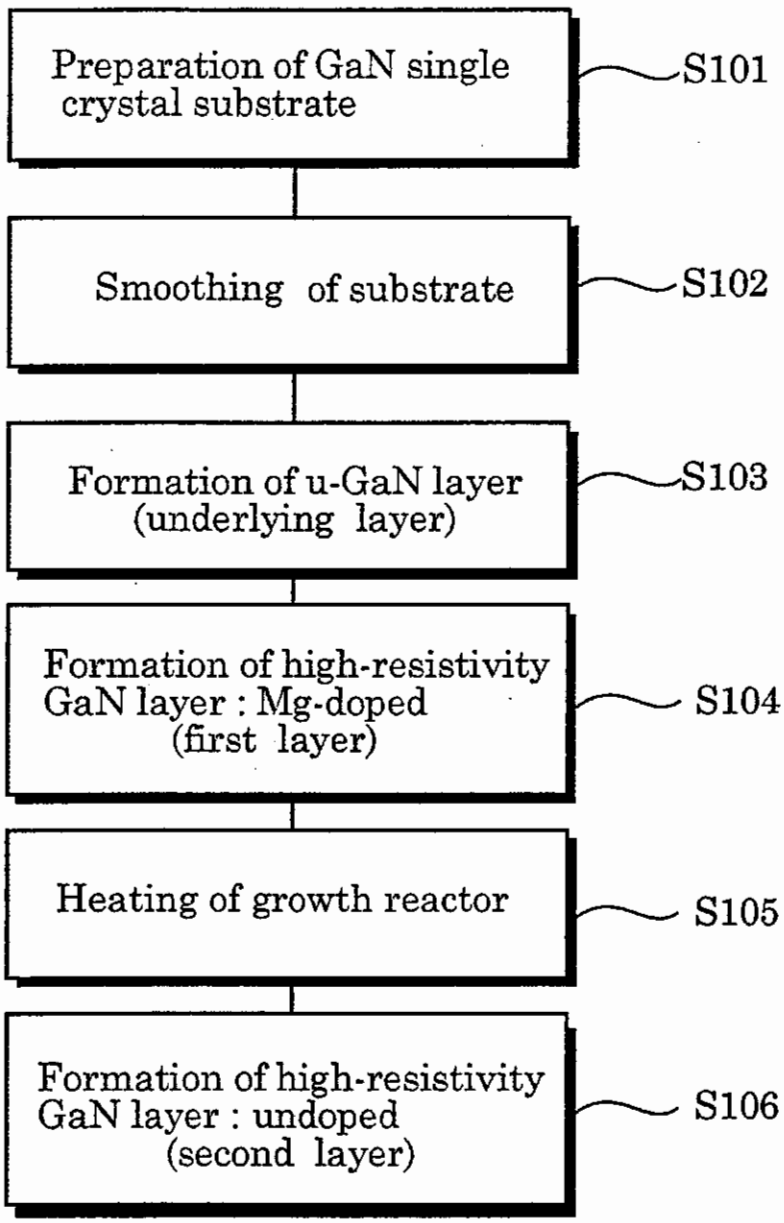

Preparation of GaN single crystal substrate
S101
Smoothing of substrate
S102
Formation of u-GaN layer (underlying layer)
S103
Formation of high-resistivity GaN layer : Mg-doped (first layer)
S104
Heating of growth reactor
S105
Formation of high-resistivity GaN layer : undoped (second layer)
S106

Fig.4

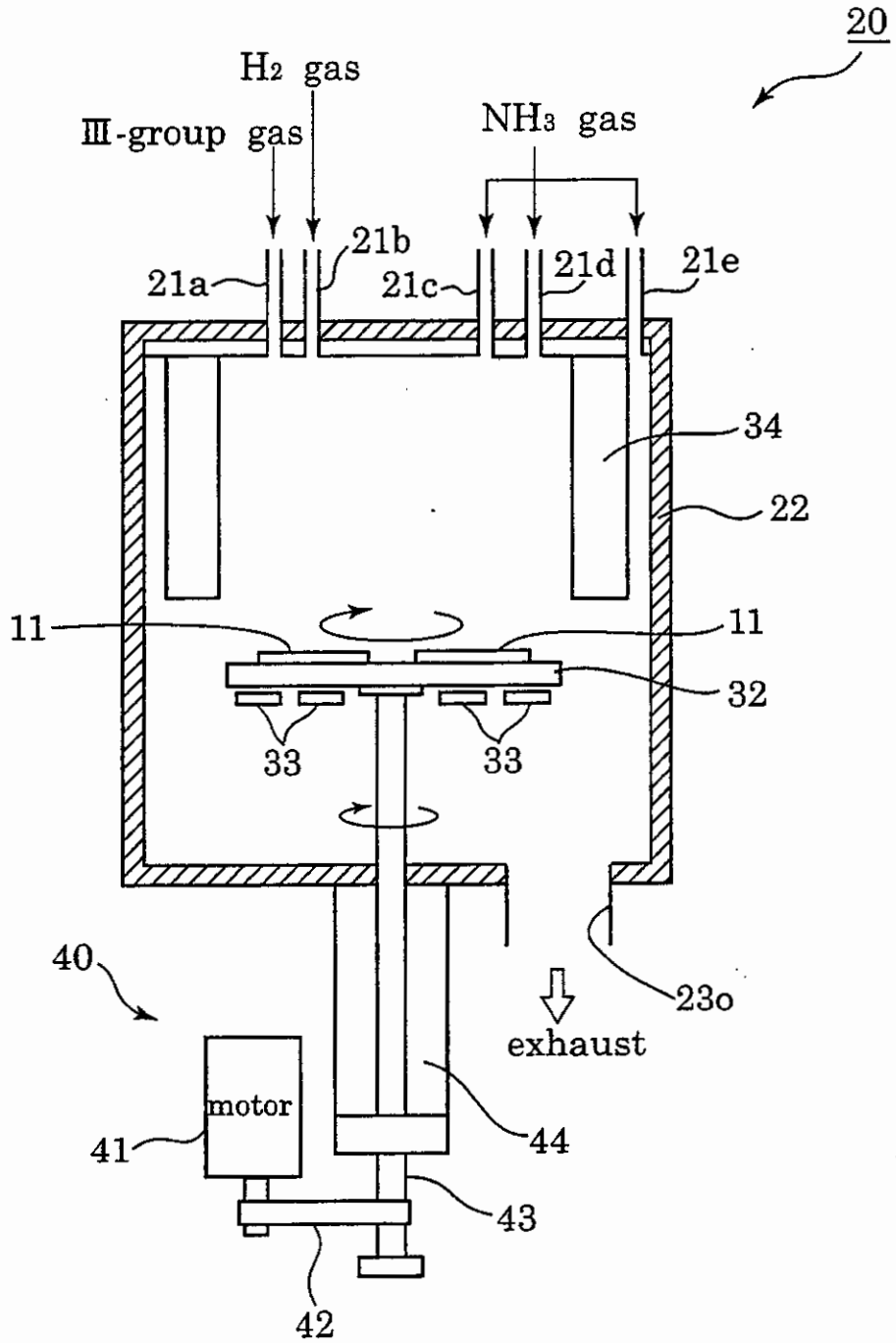

20
H2 gas
Ⅲ-group gas
NH3 gas
21a
21b
21c
21d
21e
34
22
11
11
32
33
33
40
23o
exhaust
motor
41
44
43
42

Fig.5

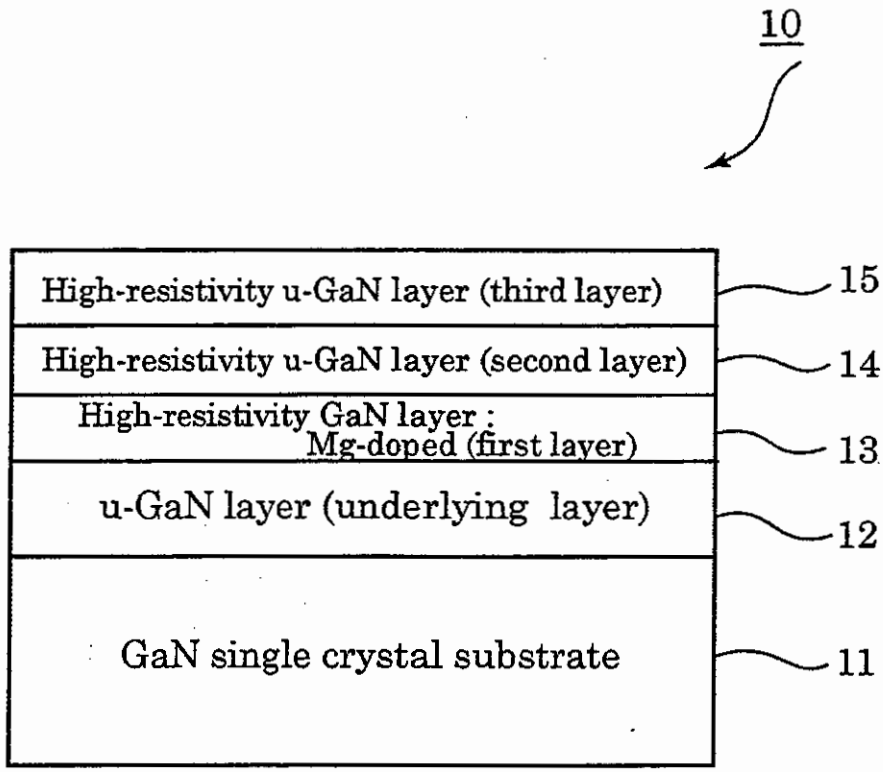

10
High-resistivity u-GaN layer (third layer)
15
High-resistivity u-GaN layer (second layer)
14
High-resistivity GaN layer : Mg-doped (first layer)
13
u-GaN layer (underlying layer)
12
GaN single crystal substrate
11

Fig.6

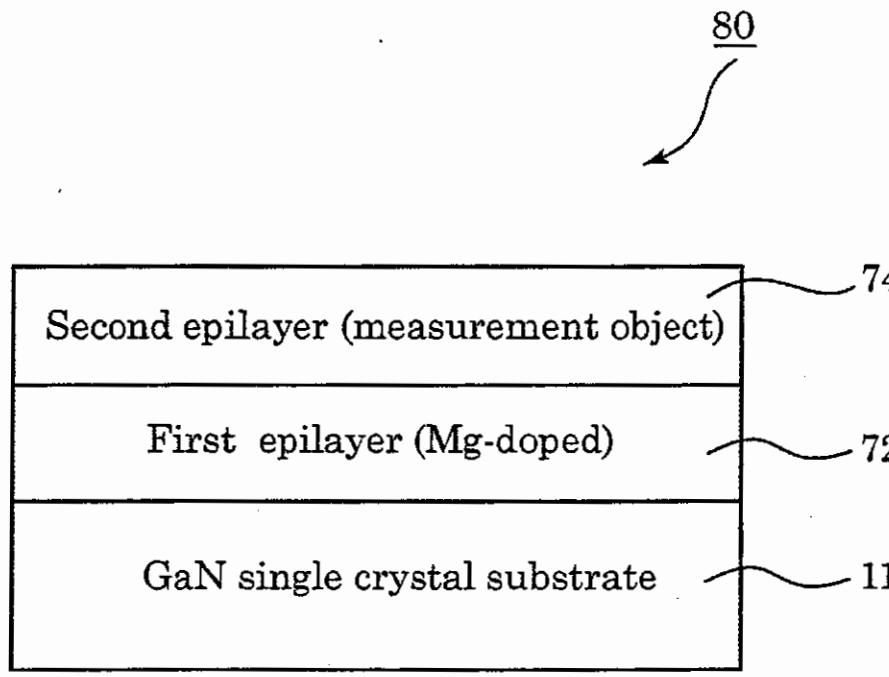

80
Second epilayer (measurement object)
74
First epilayer (Mg-doped)
72
GaN single crystal substrate
11

Fig.7

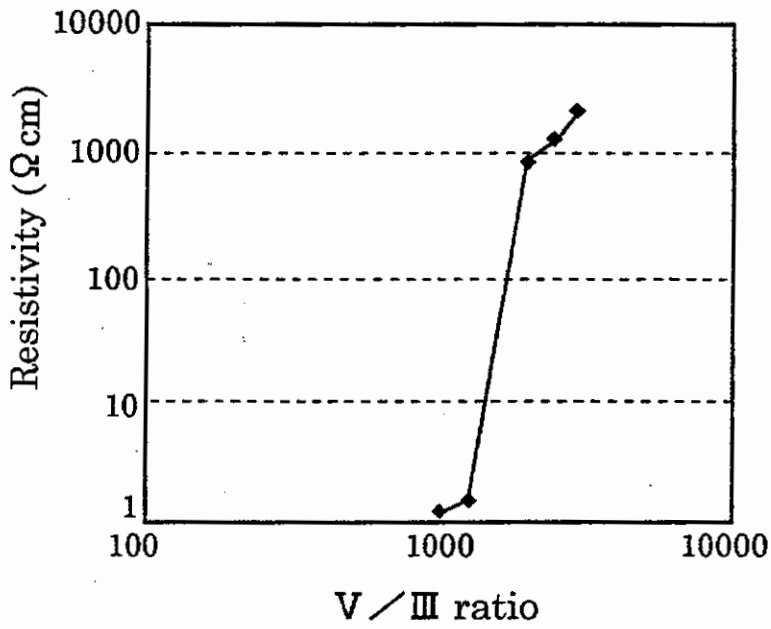


Fig.8

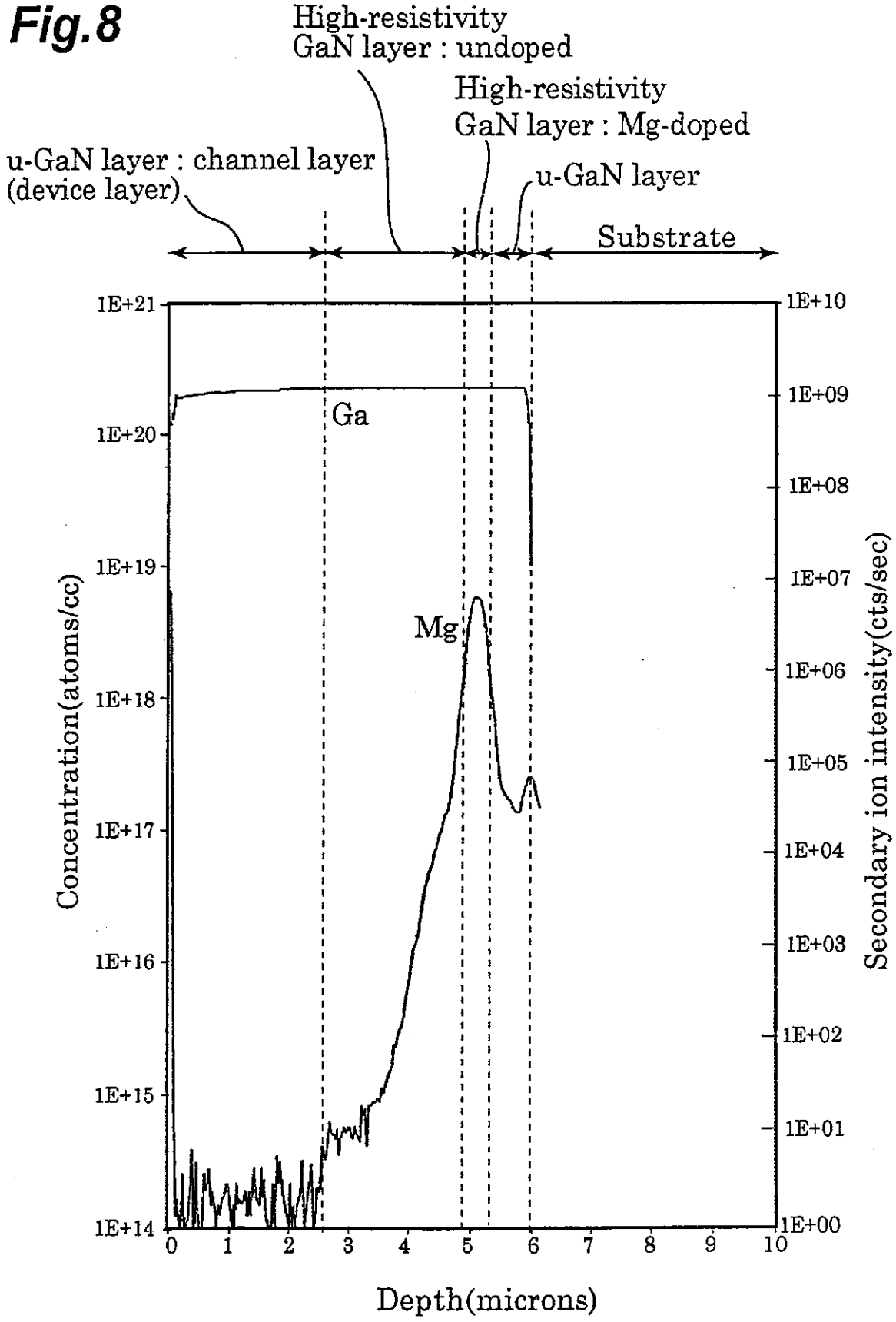
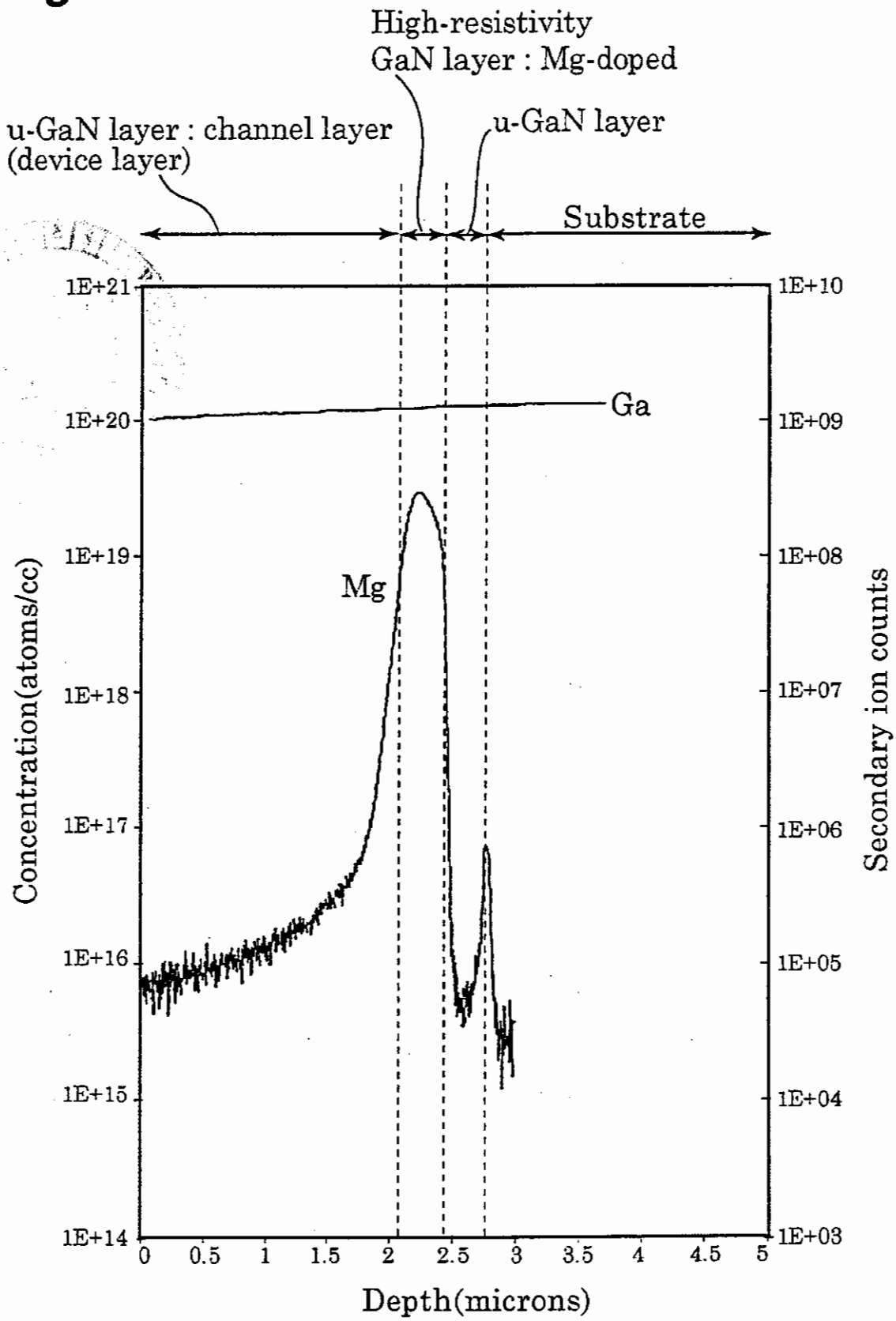

High-resistivity
GaN layer : undoped
High-resistivity
GaN layer : Mg-doped
u-GaN layer : channel layer
(device layer)
u-GaN layer
Substrate
Ga
Mg
Concentration(atoms/cc)
Secondary ion intensity(cts/sec)
Depth(microns)
1E+21
1E+20
1E+19
1E+18
1E+17
1E+16
1E+15
1E+14
1E+10
1E+09
1E+08
1E+07
1E+06
1E+05
1E+04
1E+03
1E+02
1E+01
1E+00
0
1
2
3
4
5
6
7
8
9
10

Fig.9


High-resistivity
GaN layer : Mg-doped
u-GaN layer : channel layer
(device layer)
u-GaN layer
Substrate
Ga
Mg
1E+21
1E+20
1E+19
1E+18
1E+17
1E+16
1E+15
1E+14
1E+10
1E+09
1E+08
1E+07
1E+06
1E+05
1E+04
1E+03
Concentration(atoms/cc)
Secondary ion counts
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
Depth(microns)