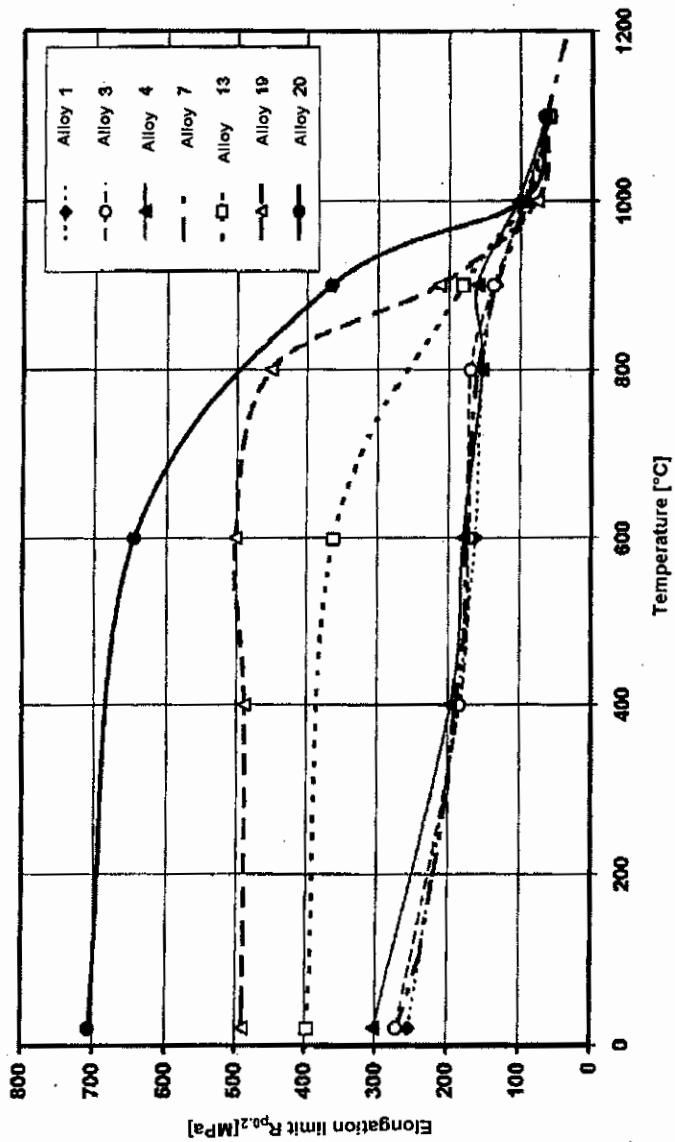

Alloy 1
Alloy 3
Alloy 4
Alloy 7
Alloy 13
Alloy 19
Alloy 20
Elongation limit $R_{p0.2}$[MPa]
800
700
600
500
400
300
200
100
0
0
200
400
600
800
1000
1200
Temperature [°C]

Fig. 1

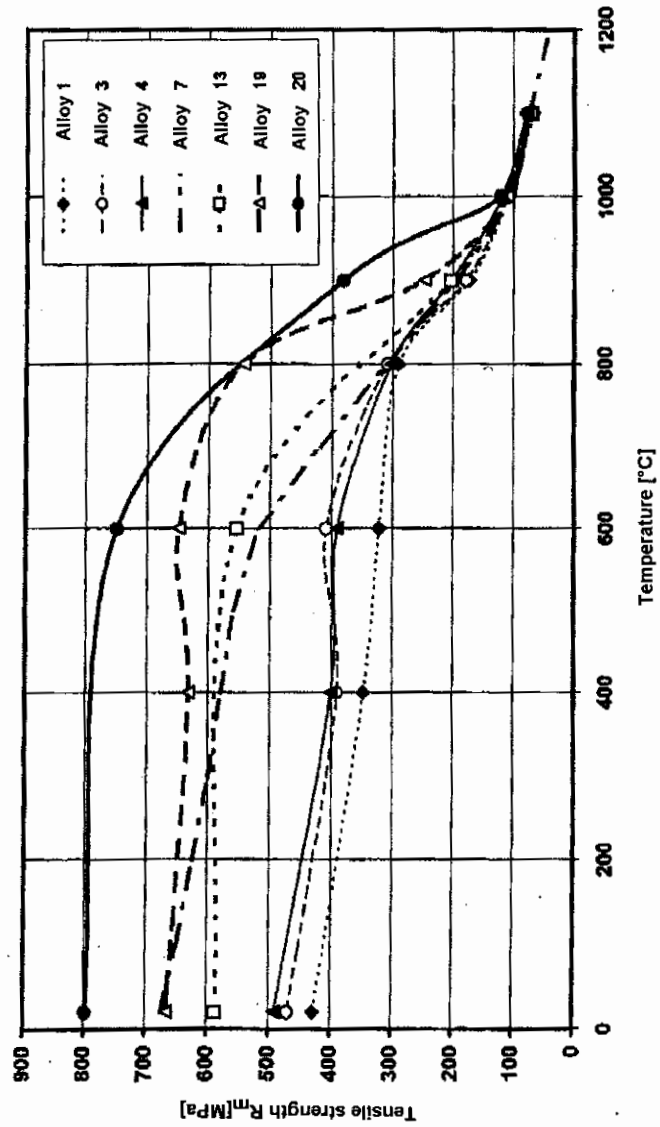

Alloy 1
Alloy 3
Alloy 4
Alloy 7
Alloy 13
Alloy 19
Alloy 20
Tensile strength R_m[MPa]
Temperature [°C]
0
100
200
300
400
500
600
700
800
900
0
200
400
600
800
1000
1200

Fig. 2

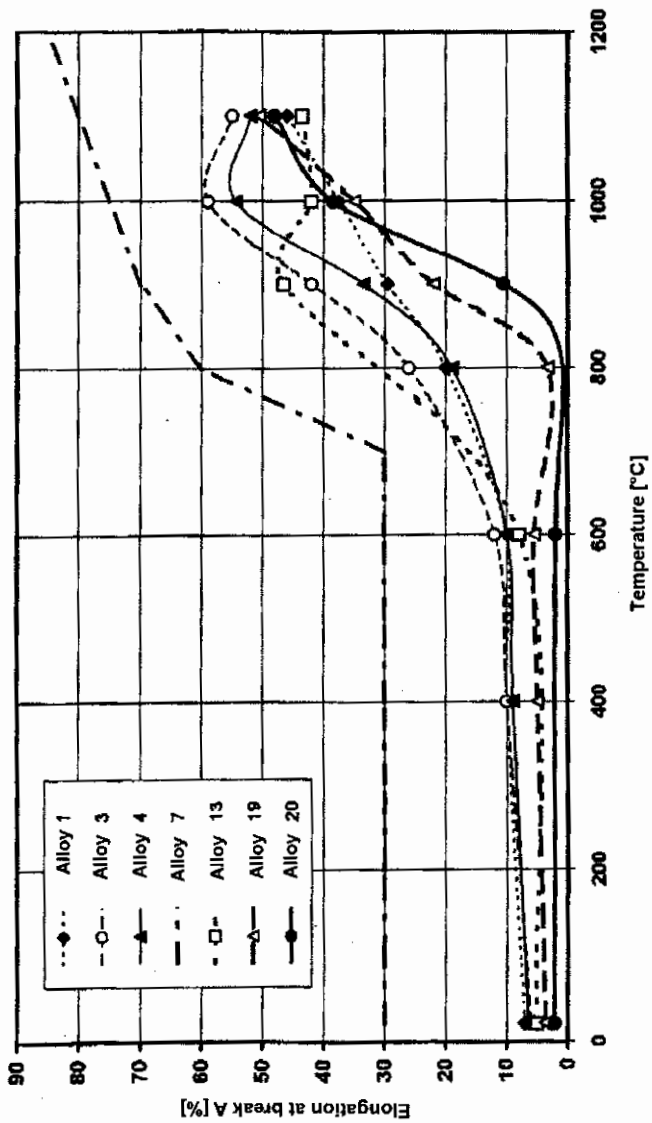

Elongation at break A [%]
Temperature [°C]
Alloy 1
Alloy 3
Alloy 4
Alloy 7
Alloy 13
Alloy 19
Alloy 20

Fig. 3

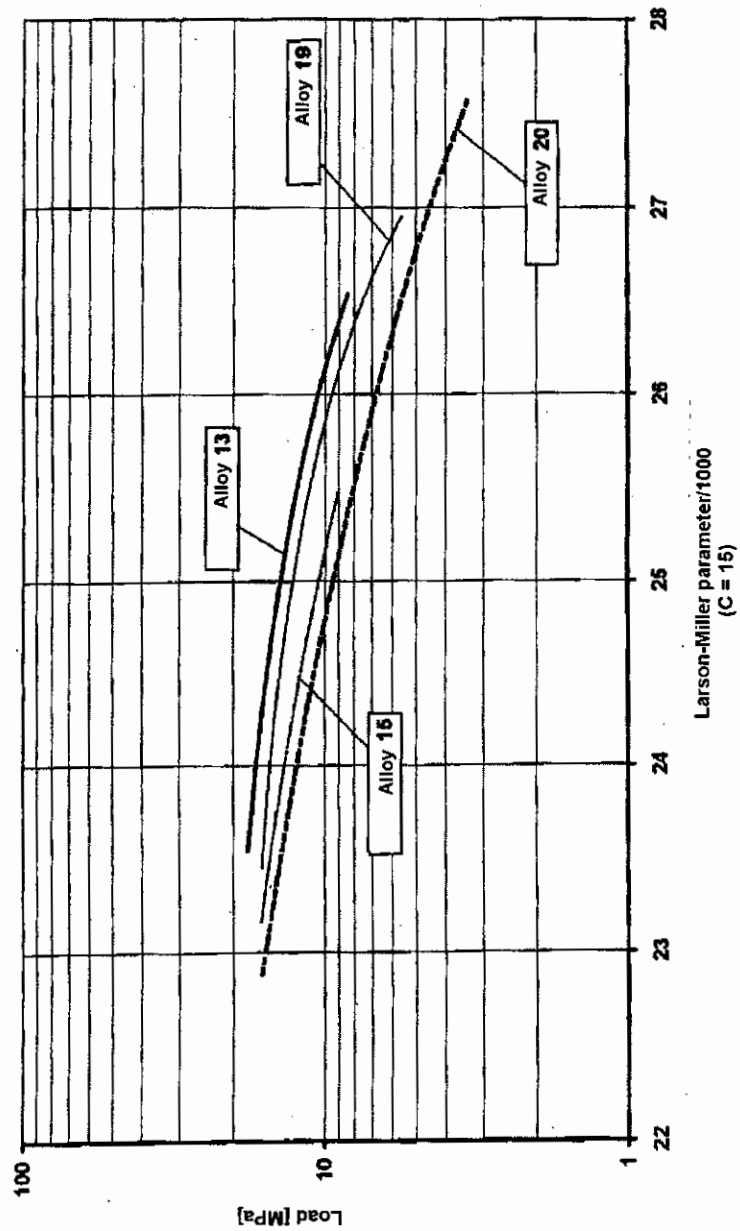

Alloy 19
Alloy 20
Alloy 13
Alloy 15
Load [MPa]
100
10
1
22
23
24
25
26
27
28
Larson-Miller parameter/1000
(C = 15)

Fig. 4

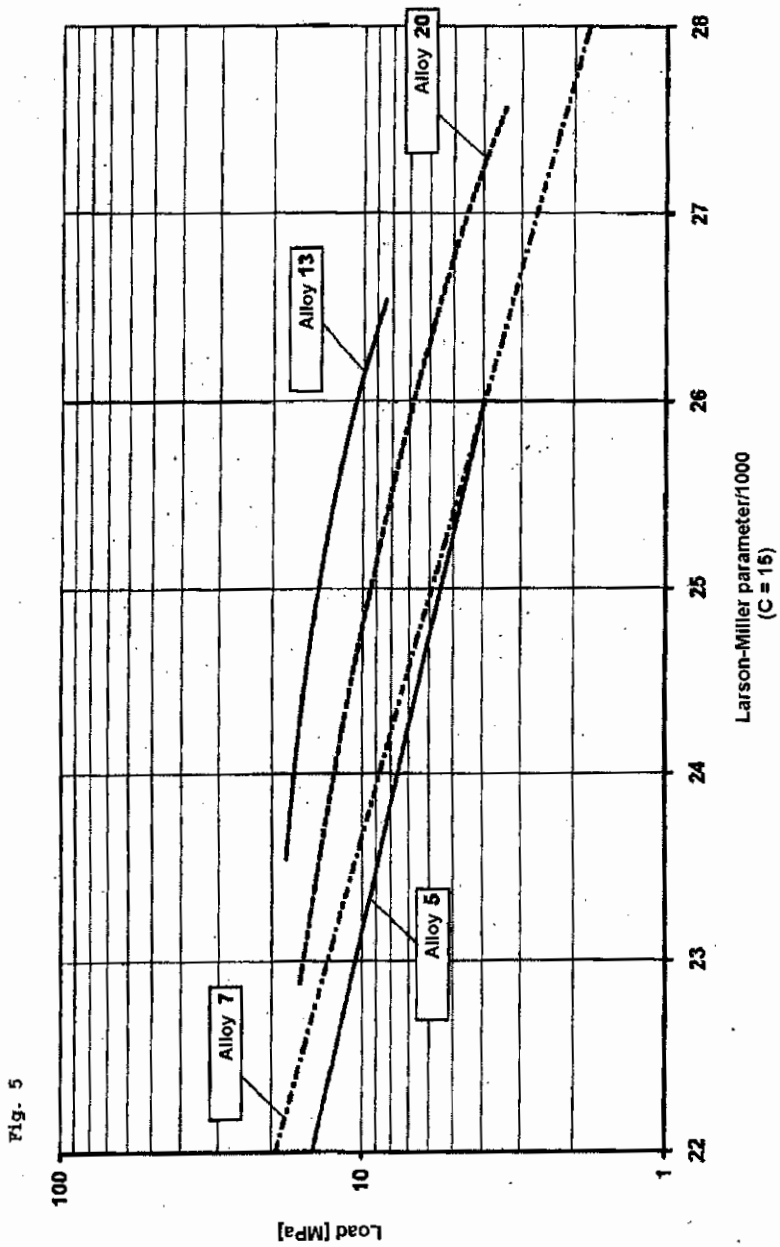

Alloy 20
Alloy 13
Alloy 5
Alloy 7
100
10
1
Load [MPa]
22
23
24
25
26
27
28
Larson-Miller parameter/1000
(C = 15)

Fig. 5

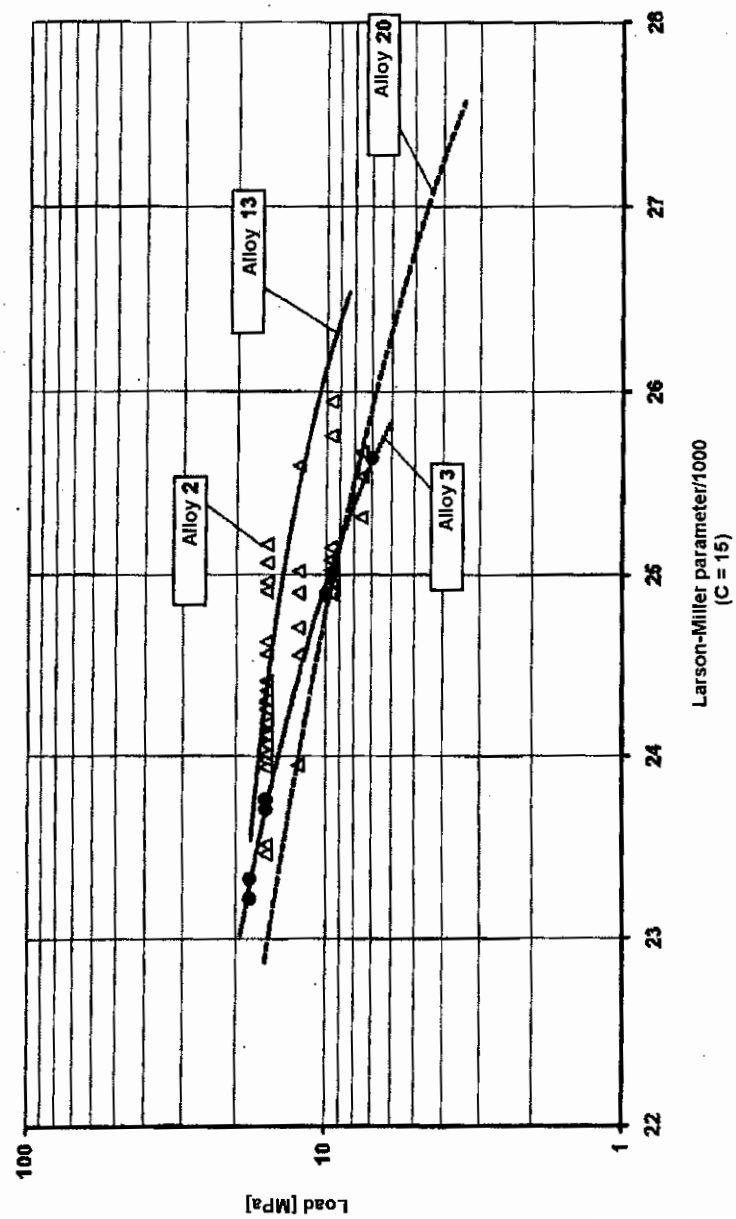

Alloy 20
Alloy 13
Alloy 2
Alloy 3
Load [MPa]
100
10
1
22
23
24
25
26
27
28
Larson-Miller parameter/1000
(C = 15)

Fig. 6

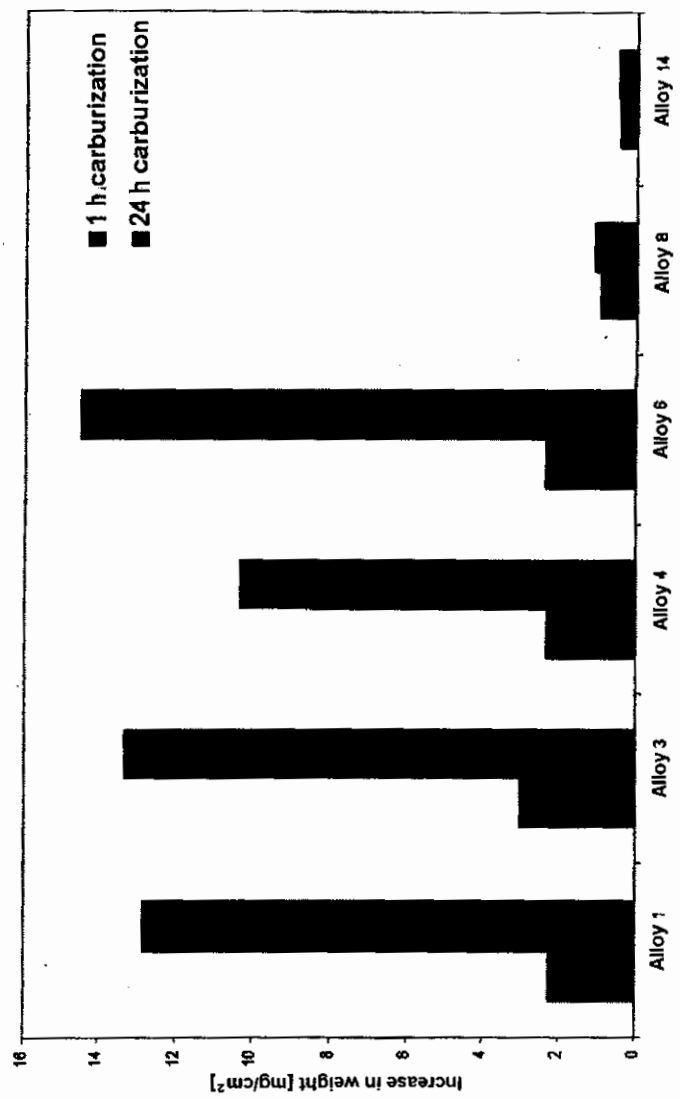

1 h carburization
24 h carburization
Increase in weight [mg/cm²]
0
2
4
6
8
10
12
14
16
Alloy 1
Alloy 3
Alloy 4
Alloy 6
Alloy 8
Alloy 14

Fig. 7

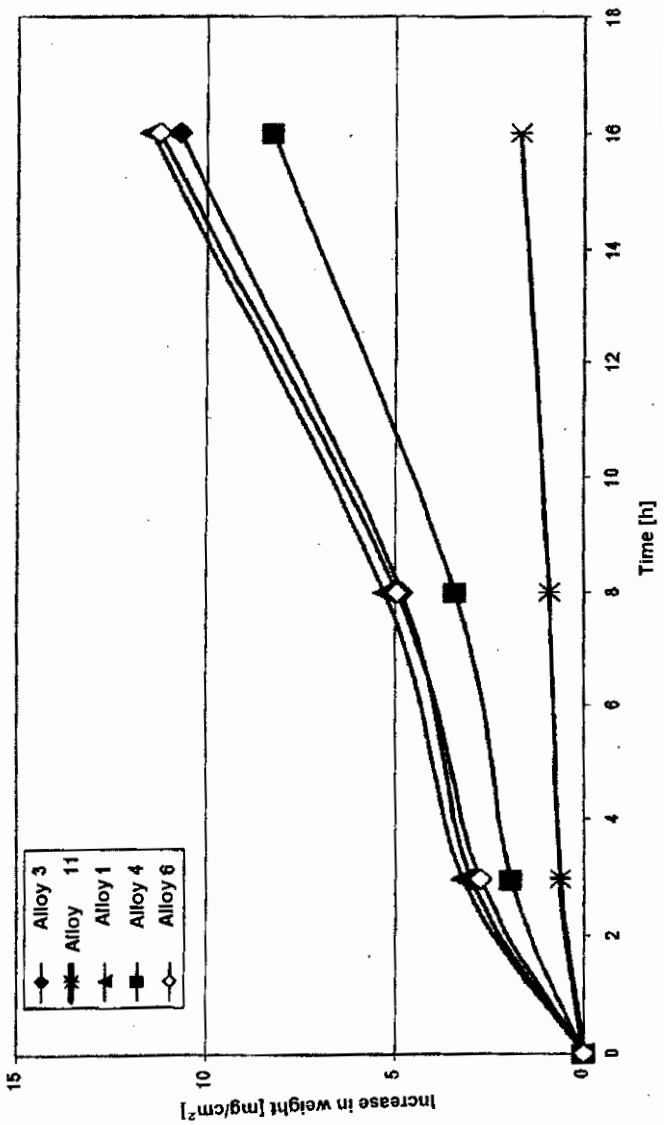

Increase in weight [mg/cm²]
Time [h]
Alloy 3
Alloy 11
Alloy 1
Alloy 4
Alloy 6
0
5
10
15
0
2
4
6
8
10
12
14
16
18

Fig. 8

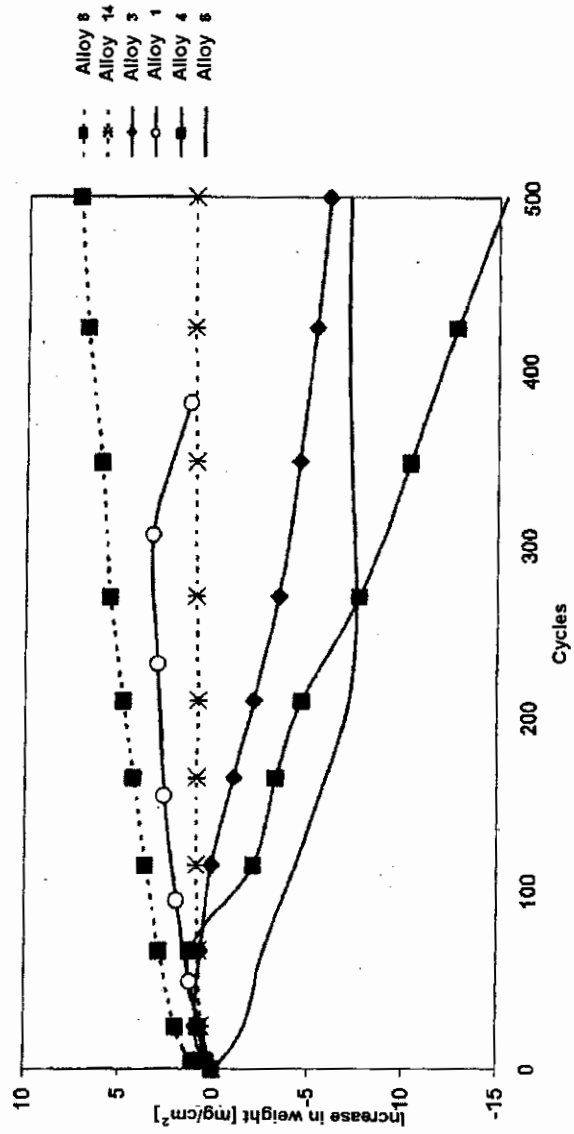

Alloy 8
Alloy 14
Alloy 3
Alloy 1
Alloy 4
Alloy 6
Increase in weight [mg/cm²]
10
5
0
-5
-10
-15
0
100
200
300
400
500
Cycles

Fig. 9

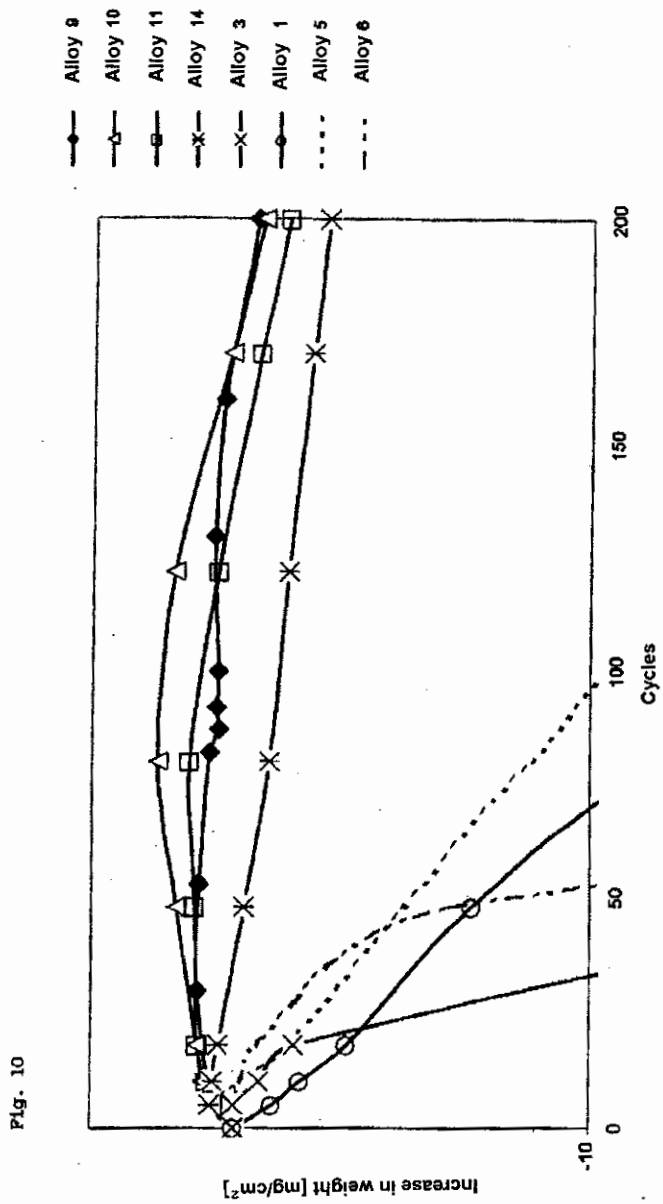

Alloy 8
Alloy 10
Alloy 11
Alloy 14
Alloy 3
Alloy 1
Alloy 5
Alloy 6
Increase in weight [mg/cm²]
-10
0
50
100
150
200
Cycles

Fig. 10

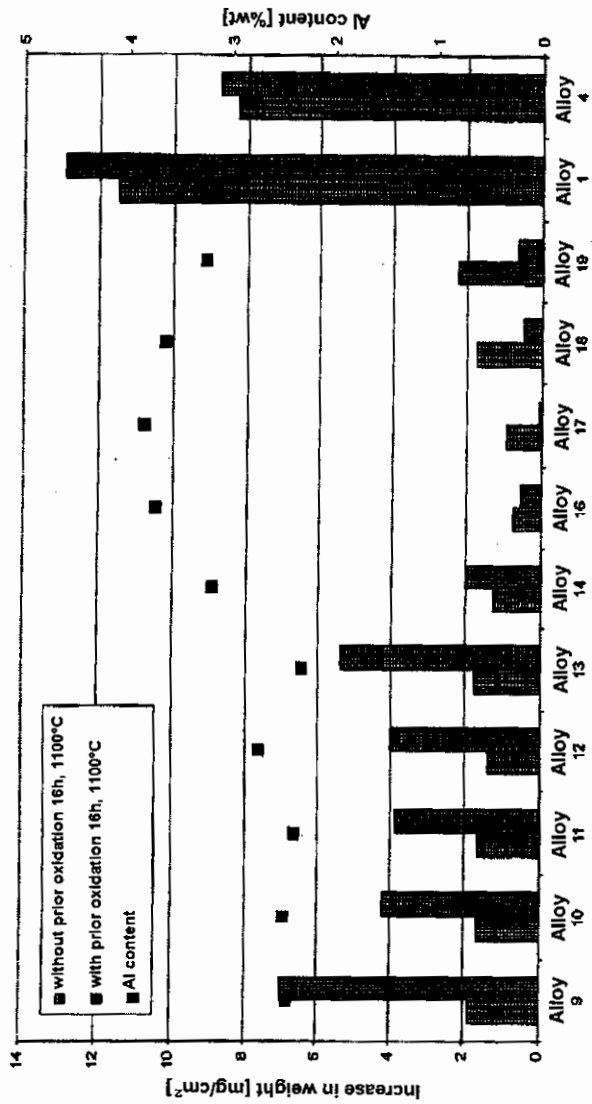

Increase in weight [mg/cm²]
Al content [%wt]
without prior oxidation 16h, 1100°C
with prior oxidation 16h, 1100°C
Al content
Alloy 9
Alloy 10
Alloy 11
Alloy 12
Alloy 13
Alloy 14
Alloy 16
Alloy 17
Alloy 18
Alloy 19
Alloy 1
Alloy 4

Fig. 11

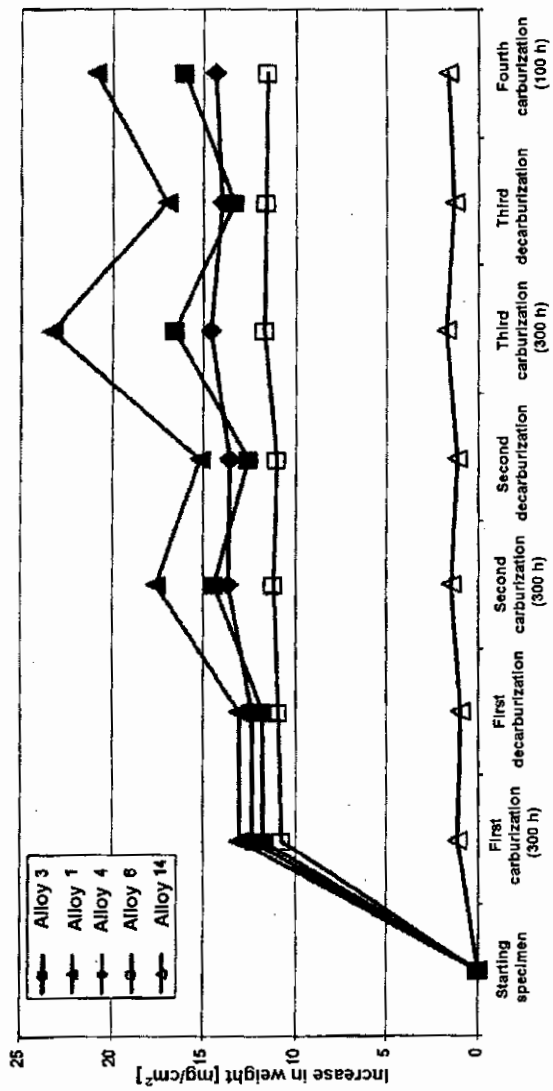

Increase in weight [mg/cm²]
25
20
15
10
5
0
Alloy 3
Alloy 1
Alloy 4
Alloy 8
Alloy 14
Starting specimen
First carburization (300 h)
First decarburization
Second carburization (300 h)
Second decarburization
Third carburization (300 h)
Third decarburization
Fourth carburization (100 h)

Fig. 12

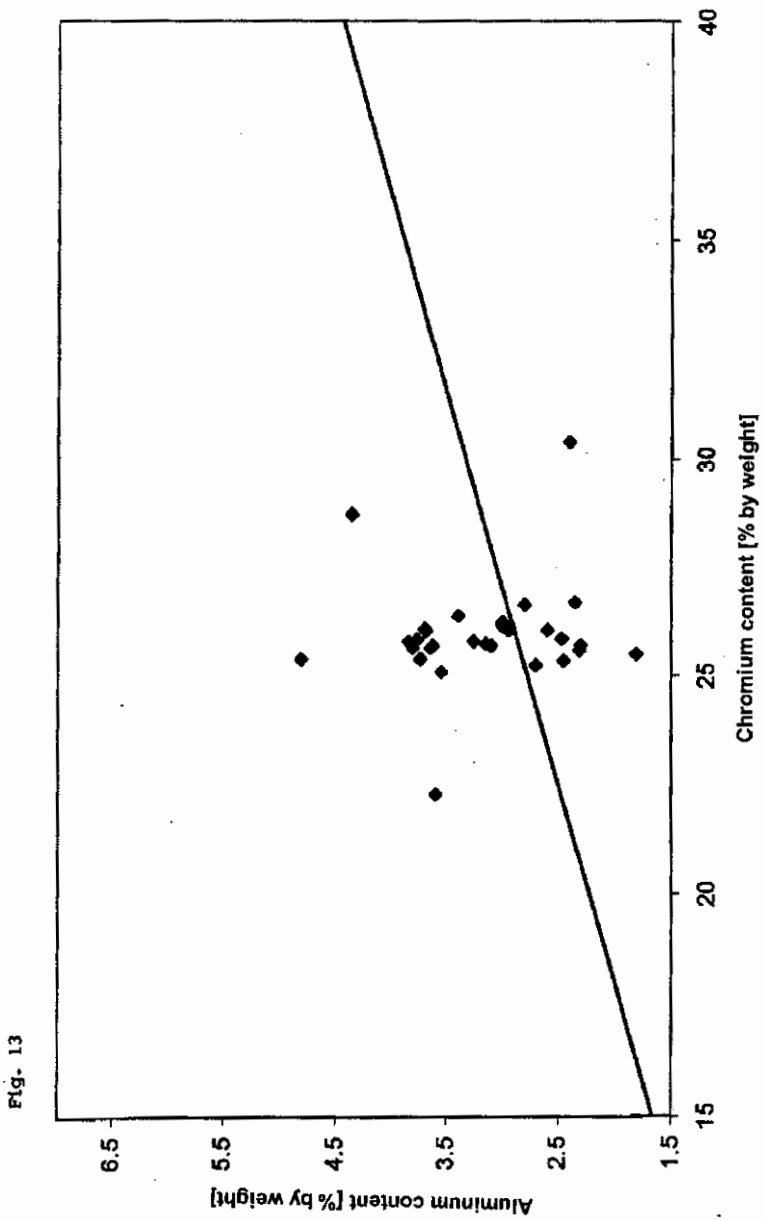

Aluminum content [% by weight]
6.5
5.5
4.5
3.5
2.5
1.5
15
20
25
30
35
40
Chromium content [% by weight]

Fig. 13

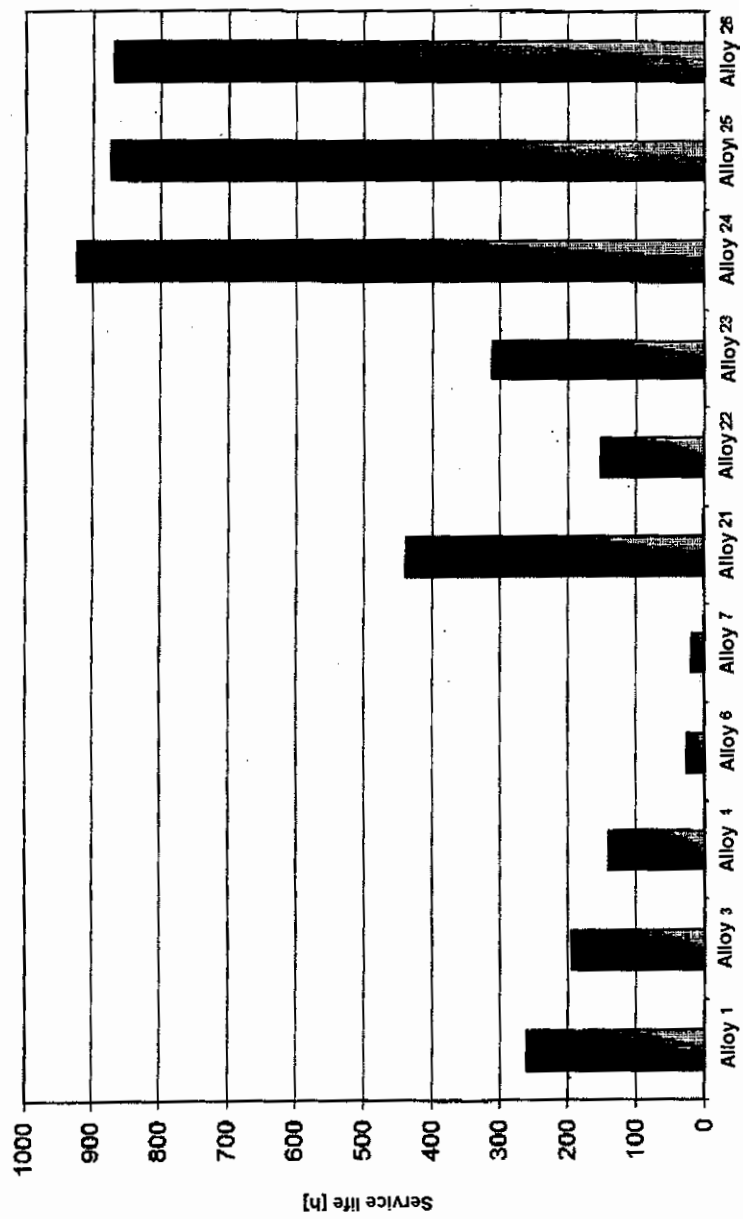

Service life [h]
0
100
200
300
400
500
600
700
800
900
1000
Alloy 1
Alloy 3
Alloy 4
Alloy 6
Alloy 7
Alloy 21
Alloy 22
Alloy 23
Alloy 24
Alloy 25
Alloy 26

Fig. 14

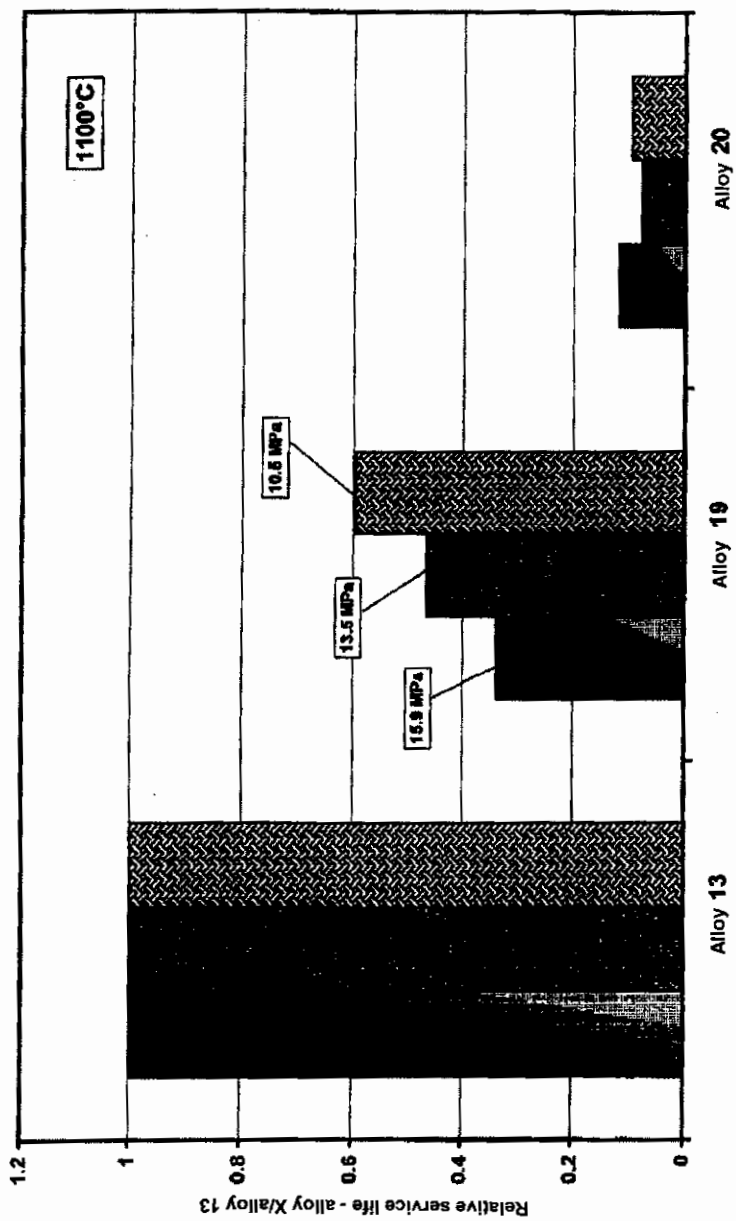

1100°C
10.5 MPa
13.5 MPa
15.9 MPa
Alloy 13
Alloy 19
Alloy 20
Relative service life - alloy X/alloy 13
1.2
1
0.8
0.6
0.4
0.2
0

Fig. 15

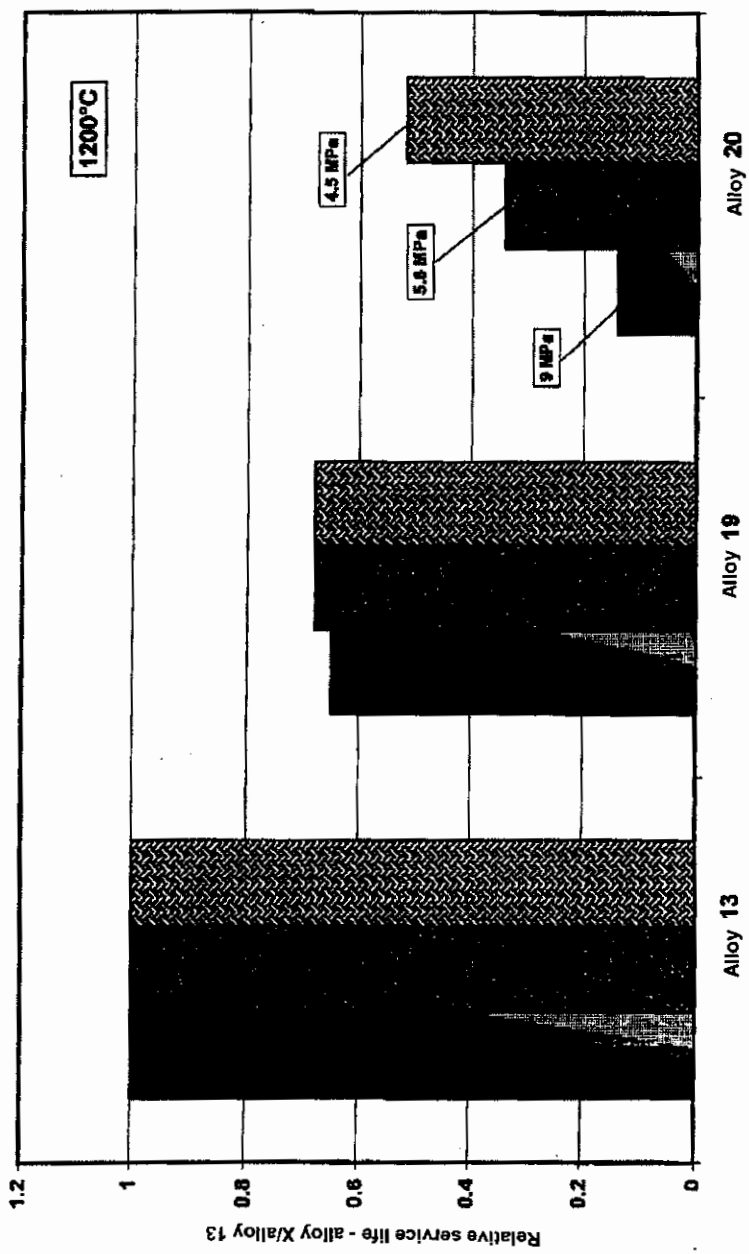

1200°C
4.5 MPa
5.8 MPa
9 MPa
Alloy 20
Alloy 19
Alloy 13
1.2
1
0.8
0.6
0.4
0.2
0
Relative service life - alloy X/alloy 13

Fig. 16