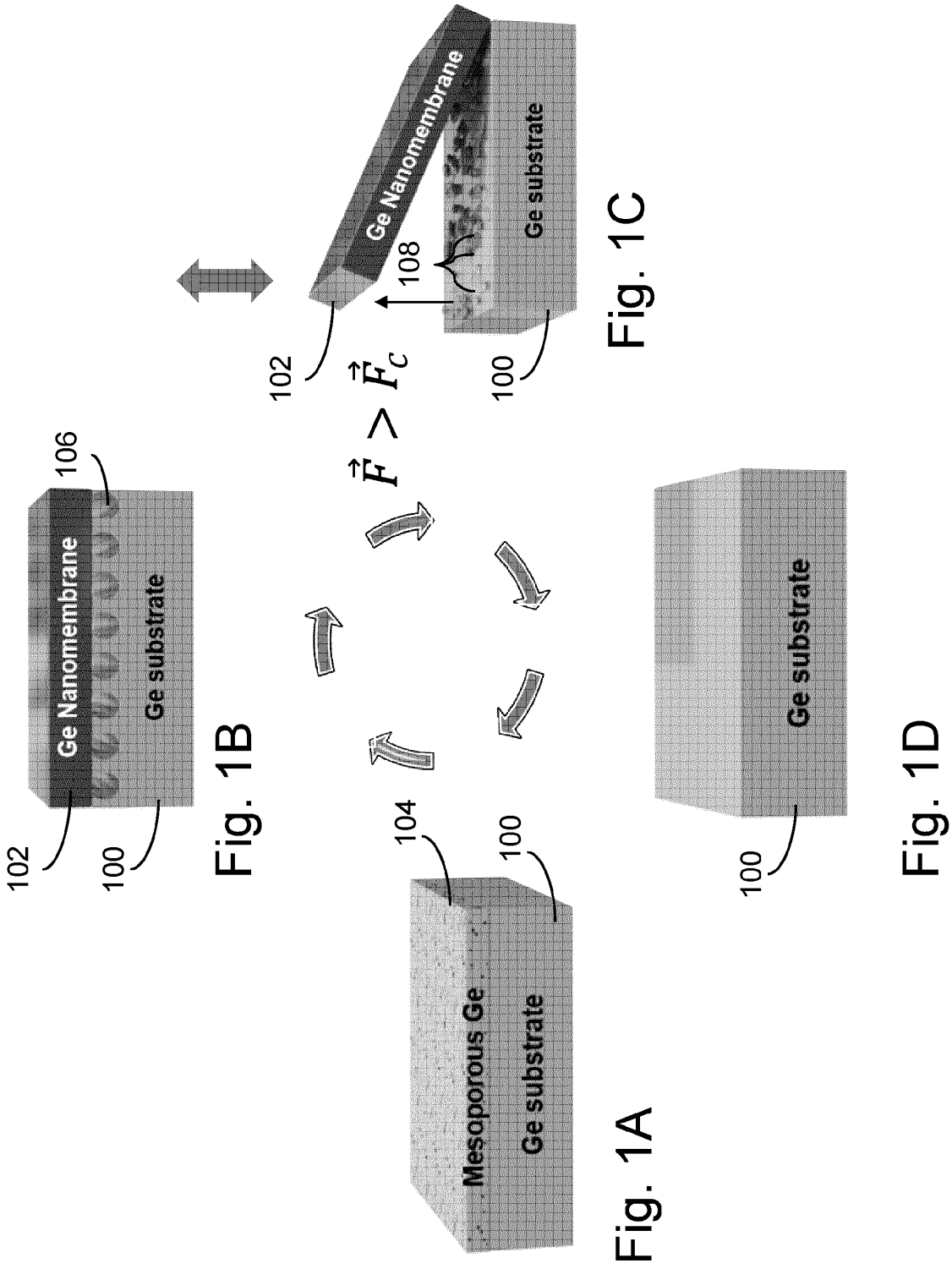


Fig. 1A

Fig. 1B

Fig. 1C

Fig. 1D

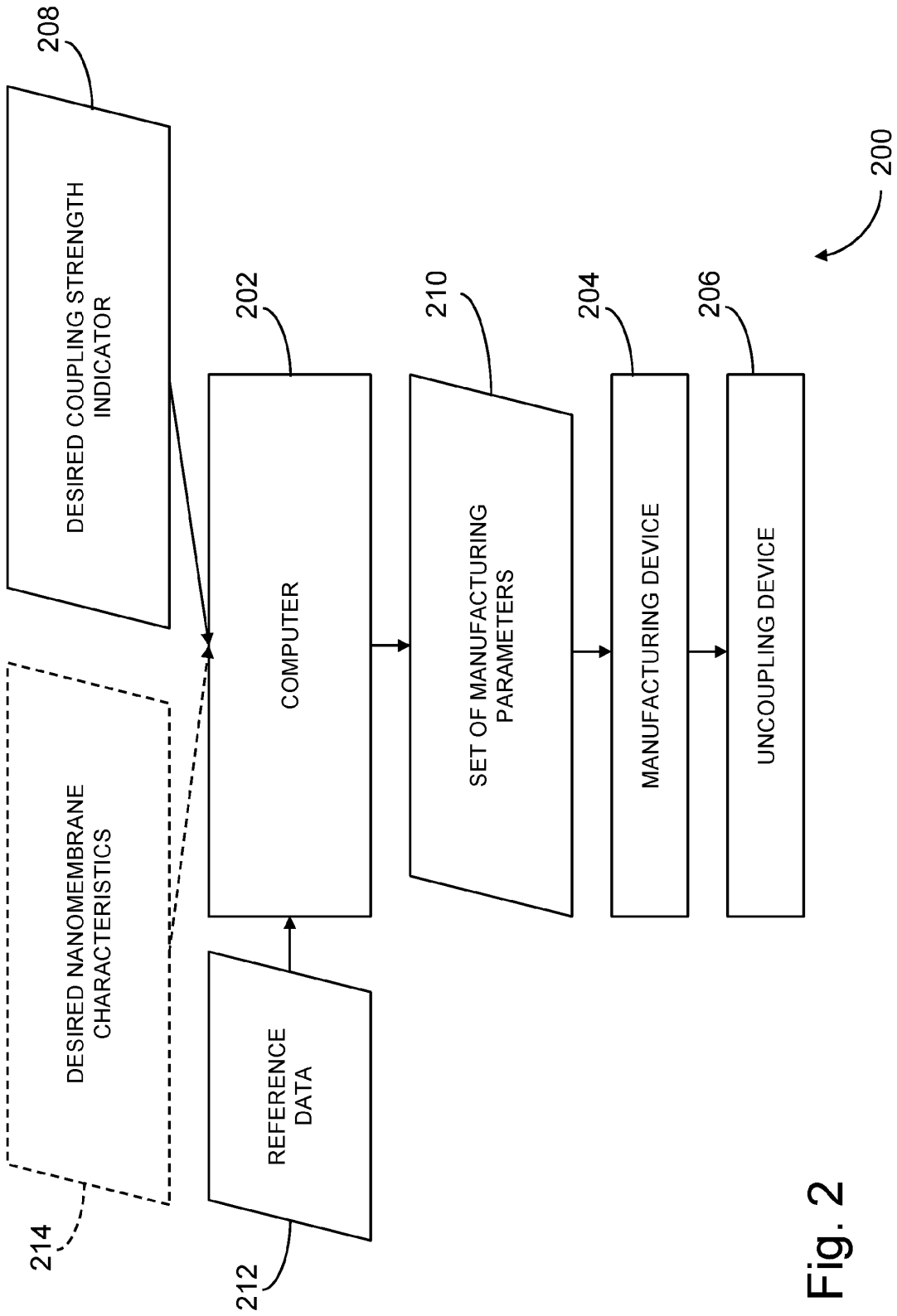

208
DESIRED COUPLING STRENGTH INDICATOR
214
DESIRED NANOMEMBRANE CHARACTERISTICS
212
REFERENCE DATA
202
COMPUTER
210
SET OF MANUFACTURING PARAMETERS
204
MANUFACTURING DEVICE
206
UNCOUPLING DEVICE
200

Fig. 2

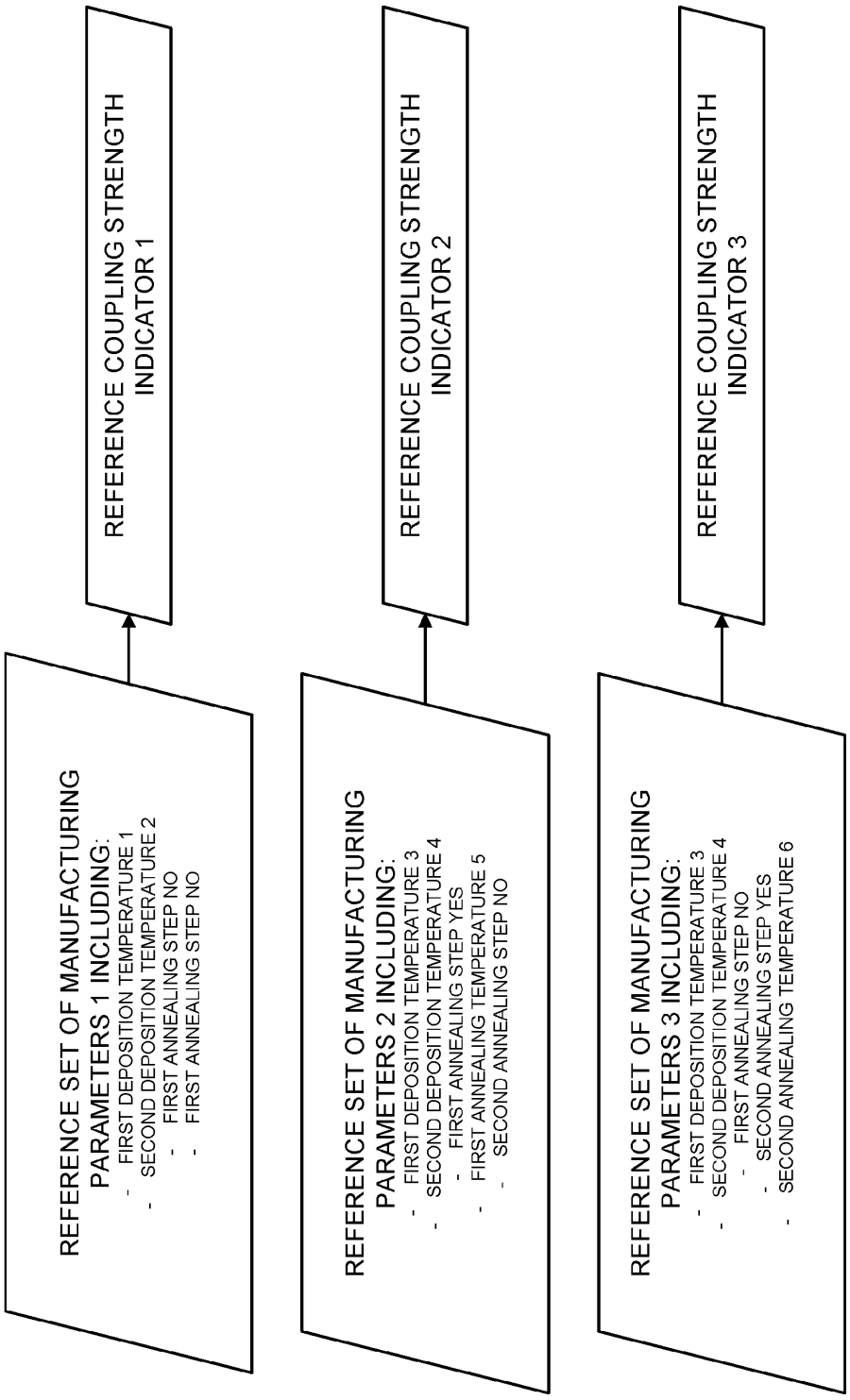

REFERENCE SET OF MANUFACTURING PARAMETERS 1 INCLUDING:
- FIRST DEPOSITION TEMPERATURE 1
- SECOND DEPOSITION TEMPERATURE 2
- FIRST ANNEALING STEP NO
- FIRST ANNEALING STEP NO
REFERENCE COUPLING STRENGTH INDICATOR 1
REFERENCE SET OF MANUFACTURING PARAMETERS 2 INCLUDING:
- FIRST DEPOSITION TEMPERATURE 3
- SECOND DEPOSITION TEMPERATURE 4
- FIRST ANNEALING STEP YES
- FIRST ANNEALING TEMPERATURE 5
- SECOND ANNEALING STEP NO
REFERENCE COUPLING STRENGTH INDICATOR 2
REFERENCE SET OF MANUFACTURING PARAMETERS 3 INCLUDING:
- FIRST DEPOSITION TEMPERATURE 3
- SECOND DEPOSITION TEMPERATURE 4
- FIRST ANNEALING STEP NO
- SECOND ANNEALING STEP YES
- SECOND ANNEALING TEMPERATURE 6
REFERENCE COUPLING STRENGTH INDICATOR 3
312

Fig. 3

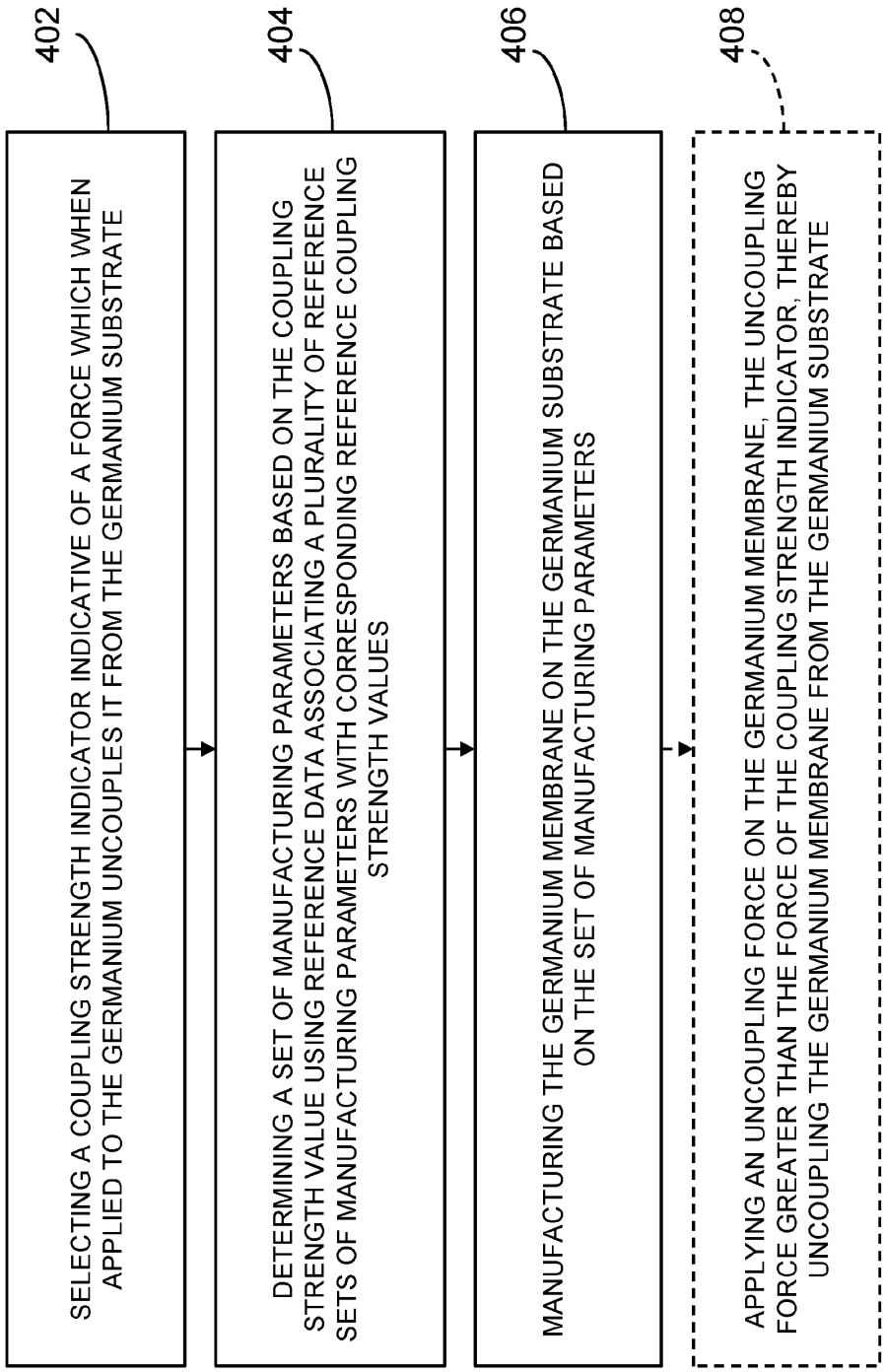

402
SELECTING A COUPLING STRENGTH INDICATOR INDICATIVE OF A FORCE WHICH WHEN APPLIED TO THE GERMANIUM UNCOUPLES IT FROM THE GERMANIUM SUBSTRATE
404
DETERMINING A SET OF MANUFACTURING PARAMETERS BASED ON THE COUPLING STRENGTH VALUE USING REFERENCE DATA ASSOCIATING A PLURALITY OF REFERENCE SETS OF MANUFACTURING PARAMETERS WITH CORRESPONDING REFERENCE COUPLING STRENGTH VALUES
406
MANUFACTURING THE GERMANIUM MEMBRANE ON THE GERMANIUM SUBSTRATE BASED ON THE SET OF MANUFACTURING PARAMETERS
408
APPLYING AN UNCOUPLING FORCE ON THE GERMANIUM MEMBRANE, THE UNCOUPLING FORCE GREATER THAN THE FORCE OF THE COUPLING STRENGTH INDICATOR, THEREBY UNCOUPLING THE GERMANIUM MEMBRANE FROM THE GERMANIUM SUBSTRATE
400

Fig. 4

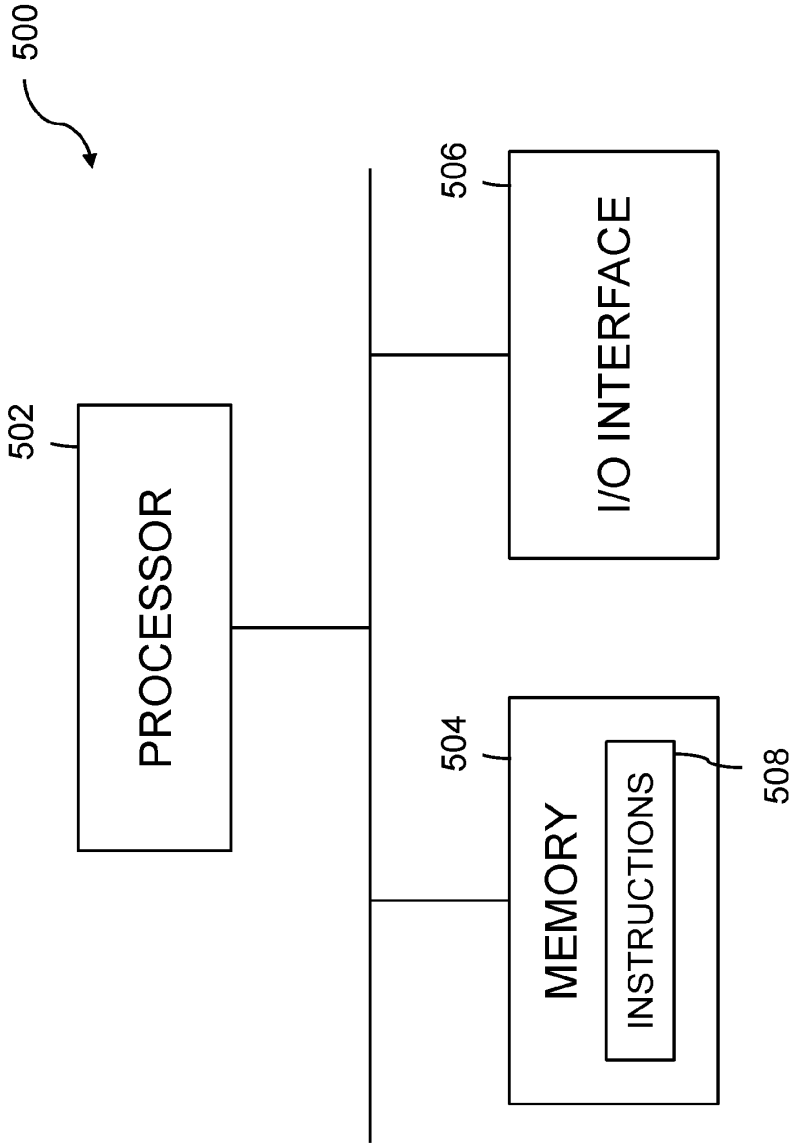

500
502
PROCESSOR
506
I/O INTERFACE
504
MEMORY
INSTRUCTIONS
508

Fig. 5

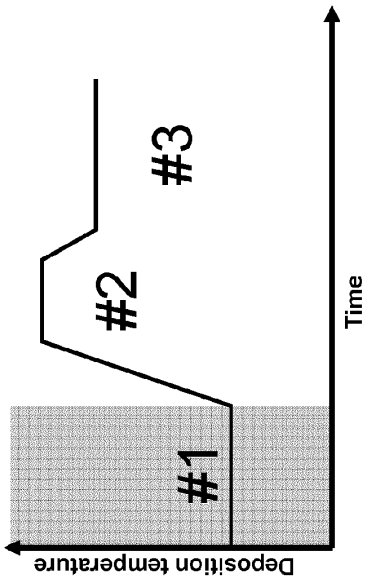


Fig. 6A

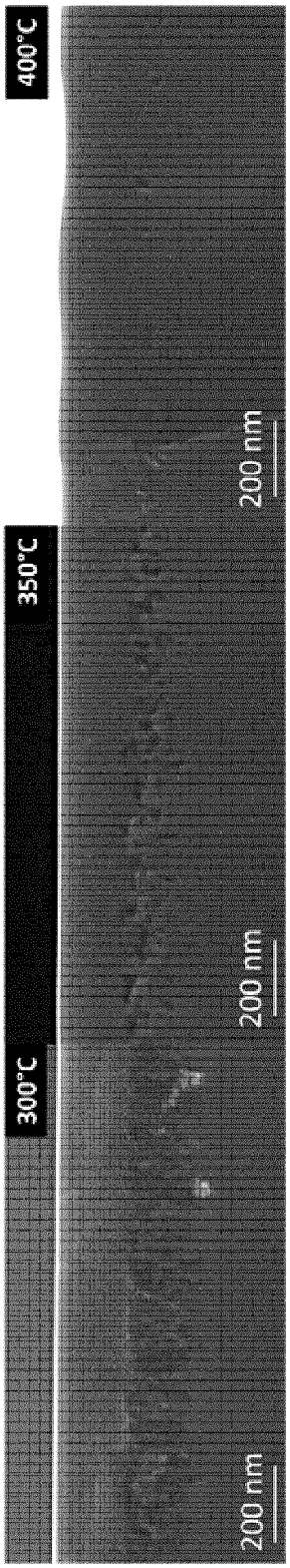


Fig. 6B Fig. 6C Fig. 6D

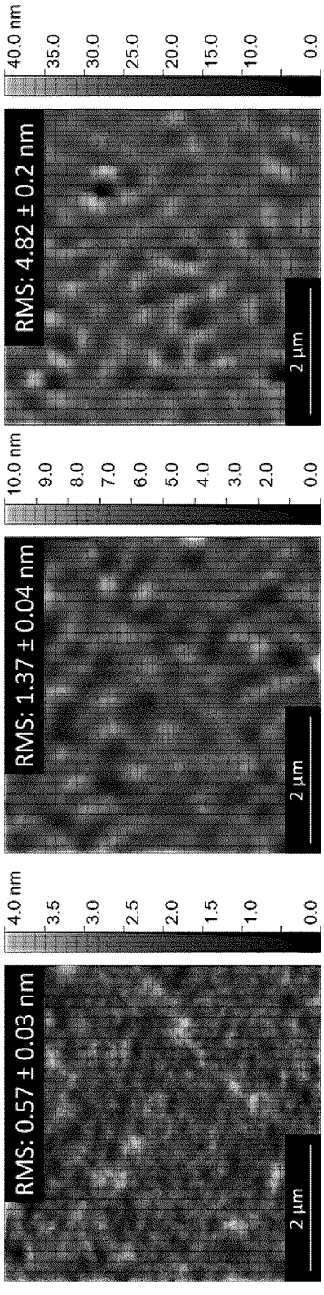


Fig. 6E Fig. 6F Fig. 6G

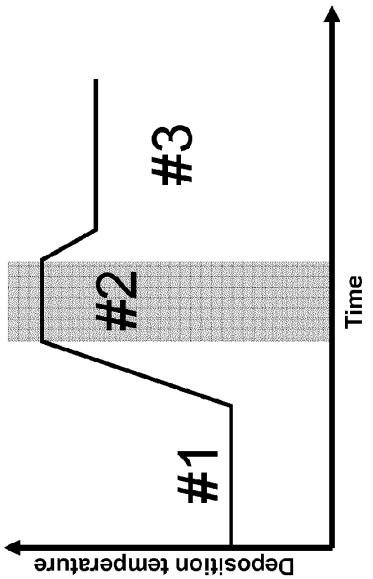


Fig. 7A

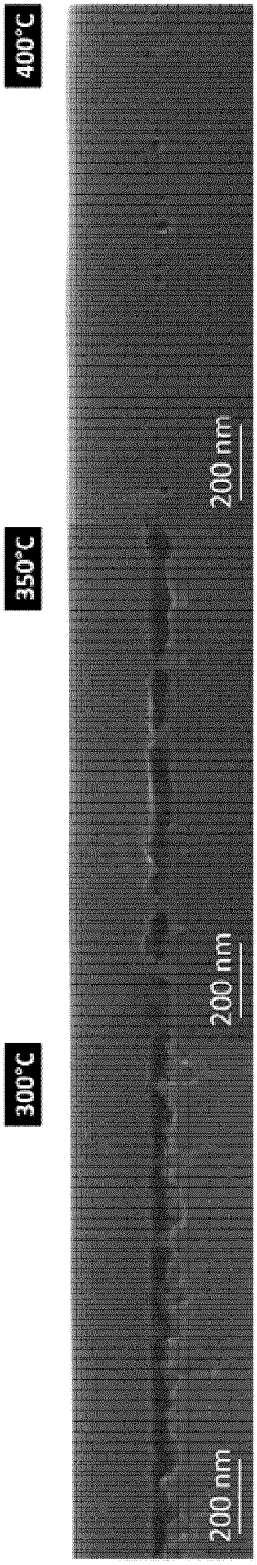


Fig. 7B

Fig. 7C

Fig. 7D

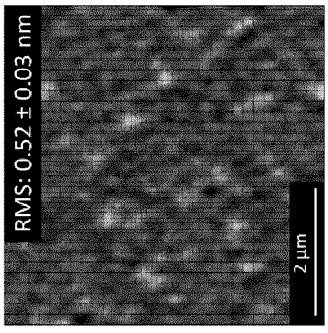


Fig. 7E

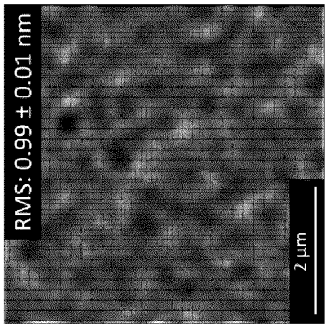


Fig. 7F

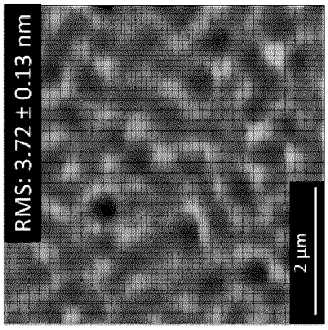


Fig. 7G

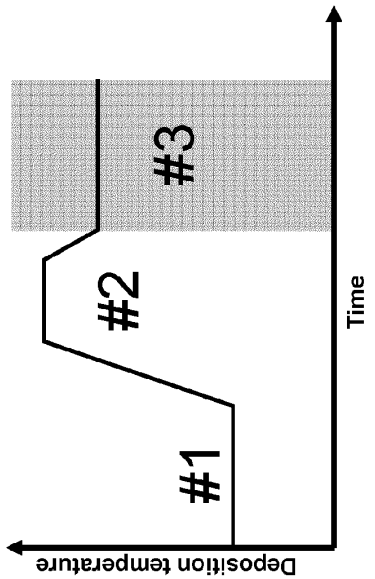


Fig. 8A

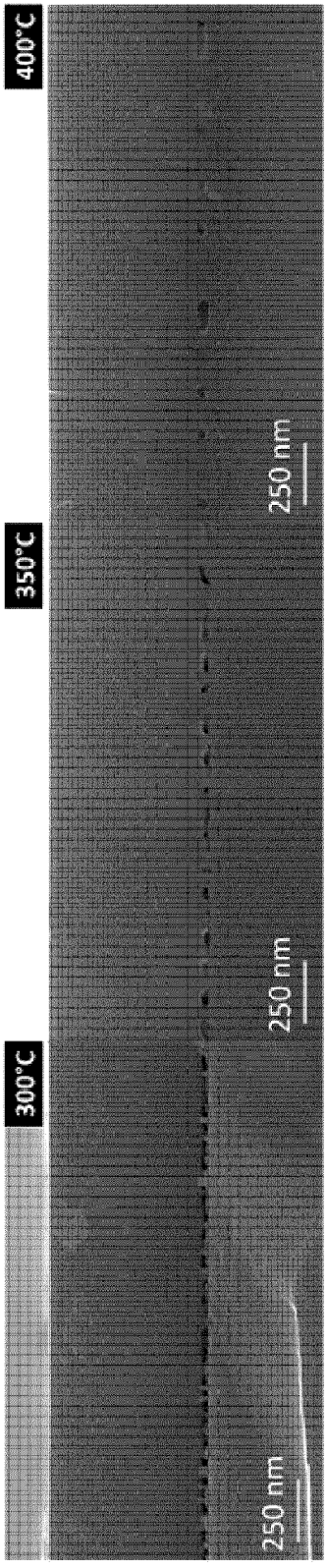


Fig. 8B

Fig. 8C

Fig. 8D

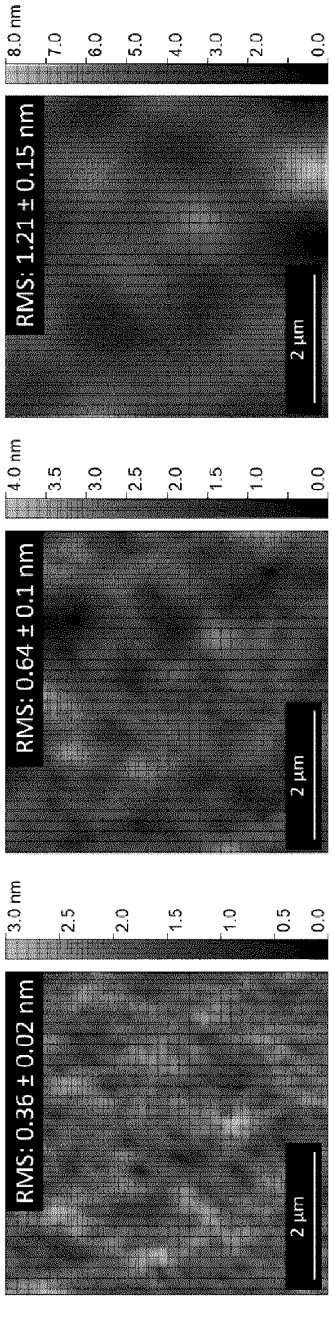


Fig. 8E

Fig. 8F

Fig. 8G

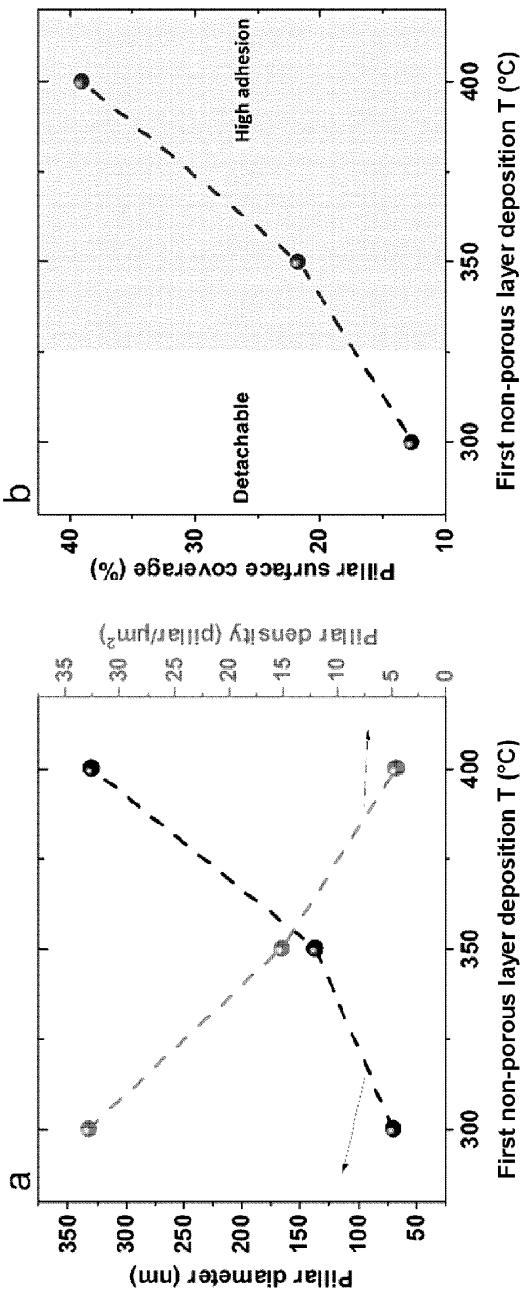


Fig. 9A

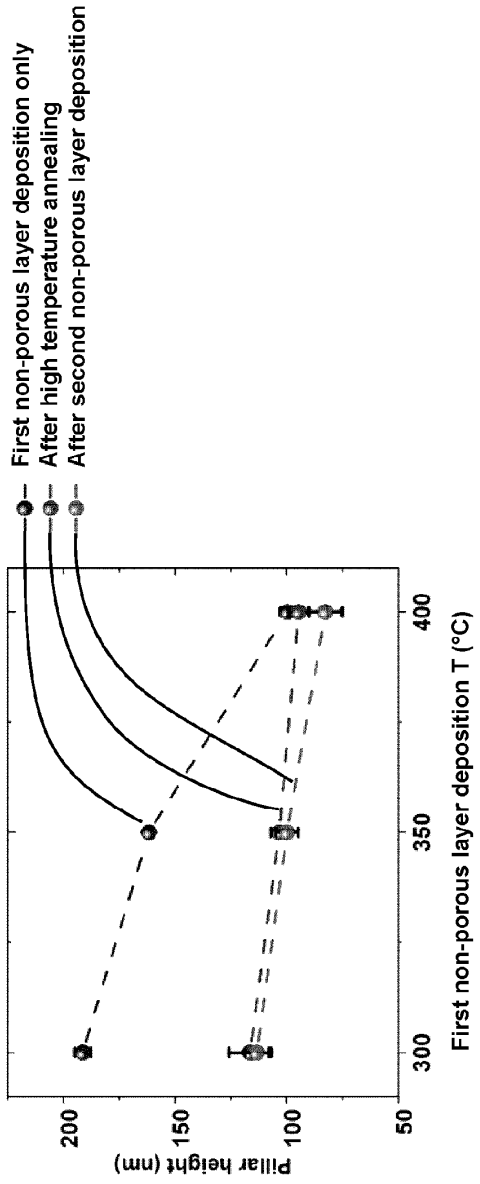


Fig. 9B

Fig. 9C

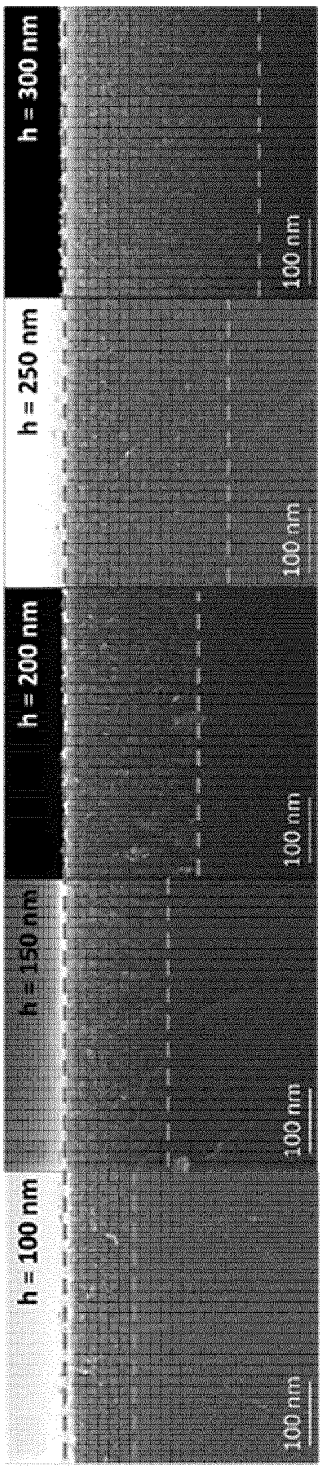


Fig. 10A

Fig. 10B

Fig. 10C

Fig. 10D

Fig. 10E

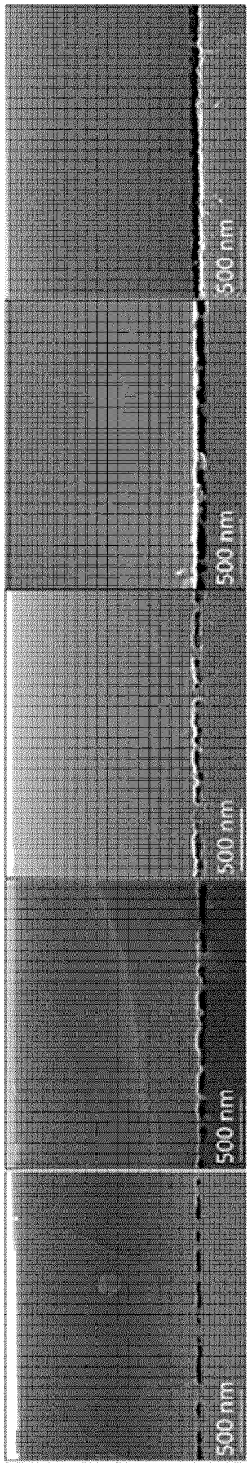


Fig. 10F

Fig. 10G

Fig. 10H

Fig. 10I

Fig. 10J

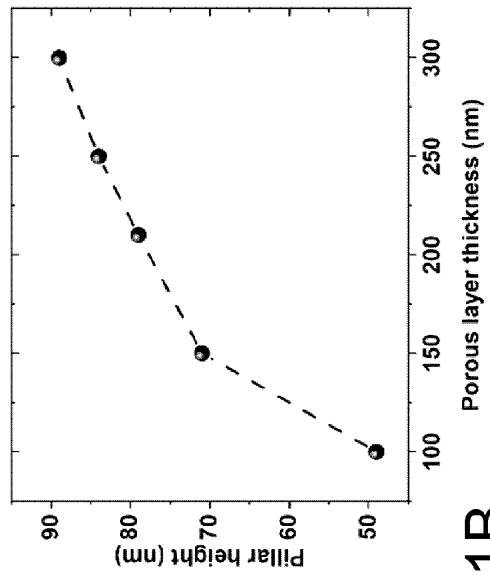


Fig. 11B

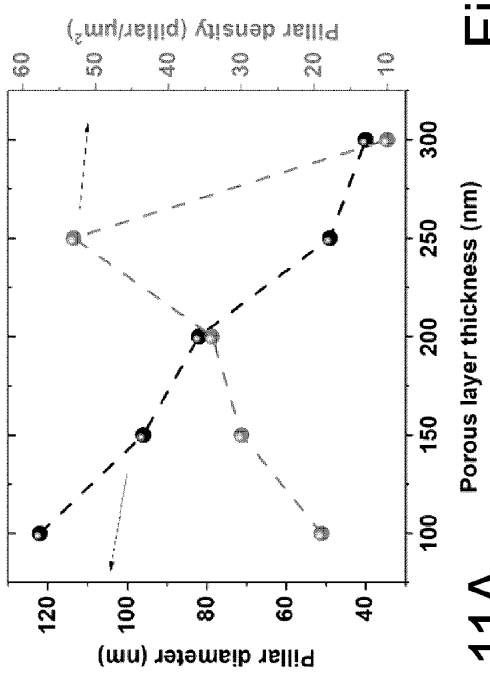


Fig. 11A

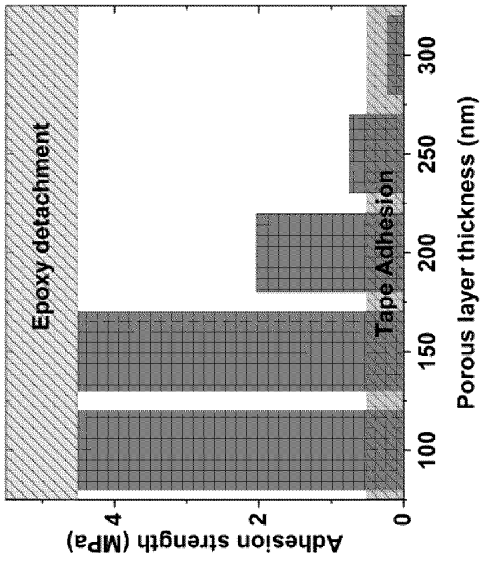


Fig. 11D

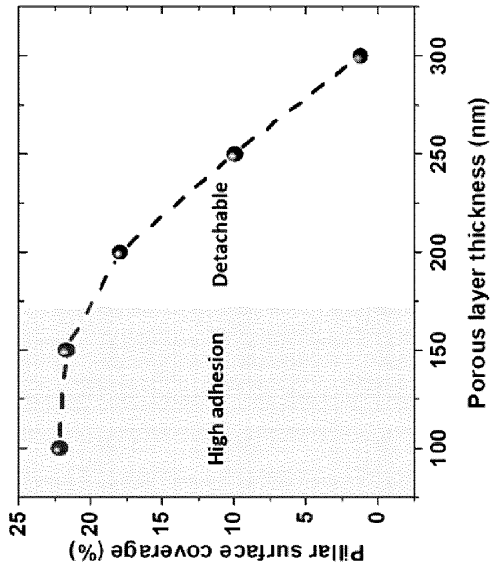


Fig. 11C

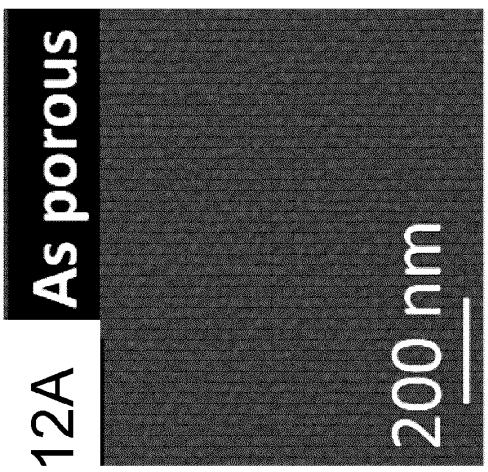


Fig. 12A

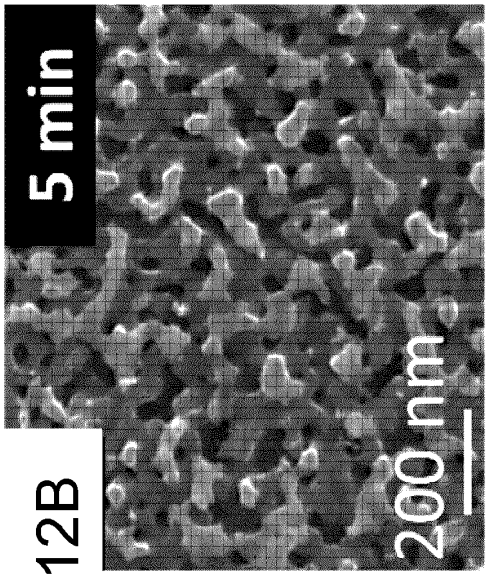


Fig. 12B

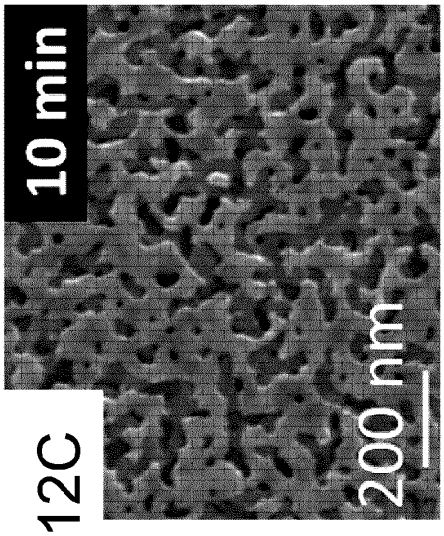


Fig. 12C

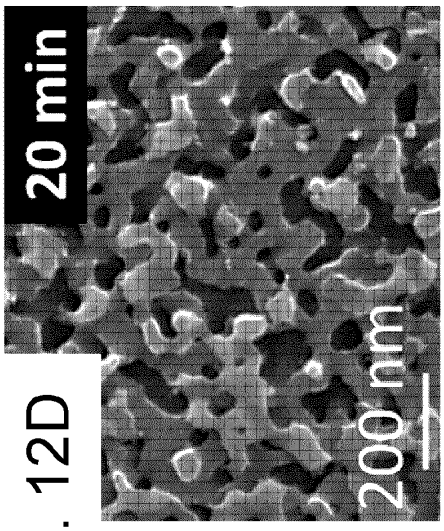


Fig. 12D

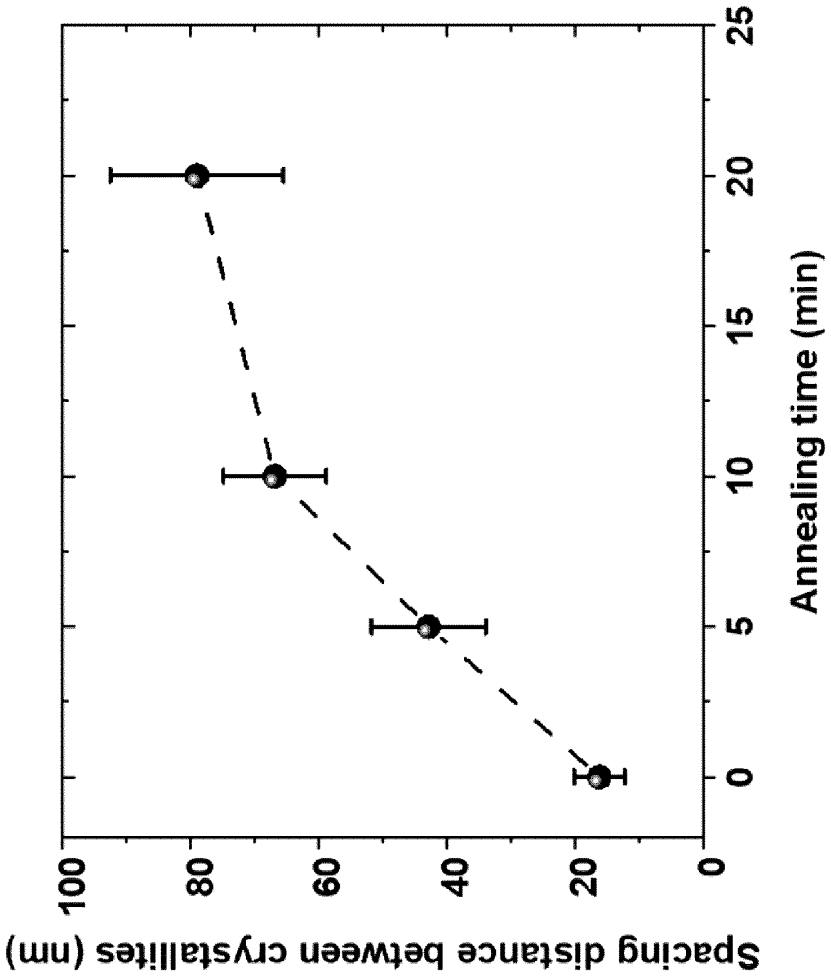

Spacing distance between crystallites (nm)
100
80
60
40
20
0
0
5
10
15
20
25
Annealing time (min)

Fig. 12E

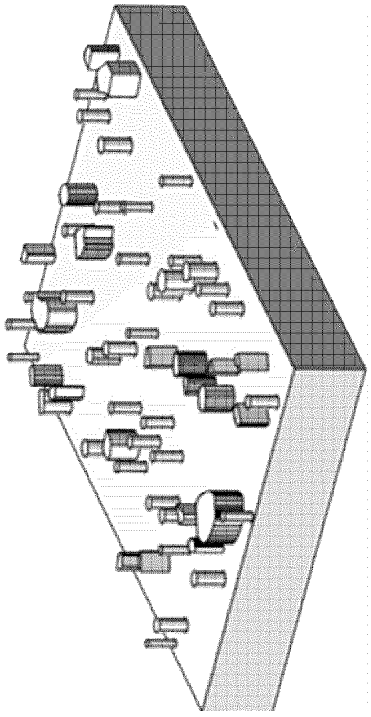


Fig. 13A

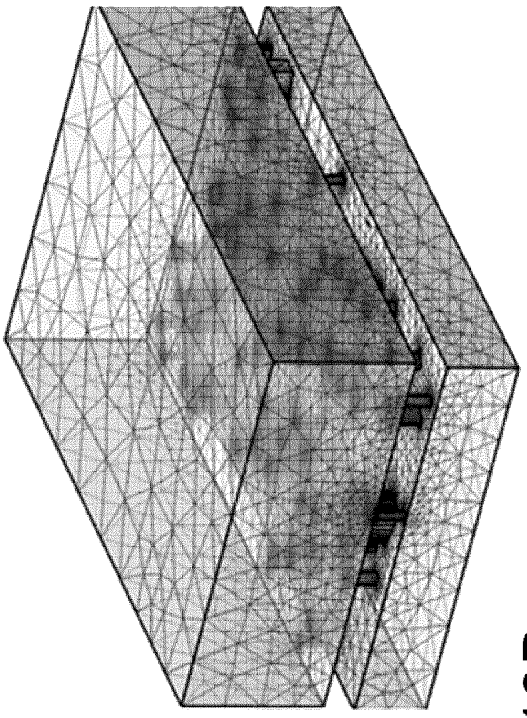


Fig. 13B

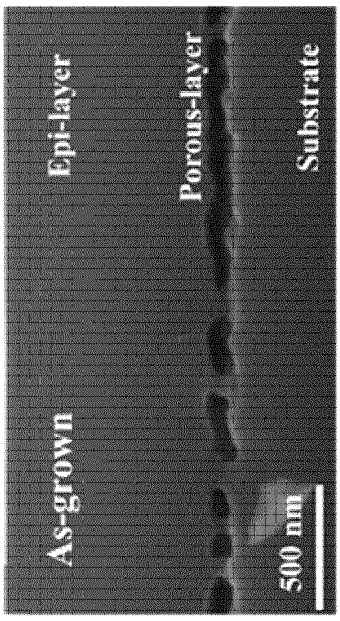


Fig. 14B

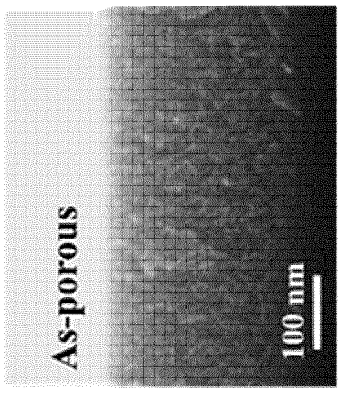


Fig. 14A

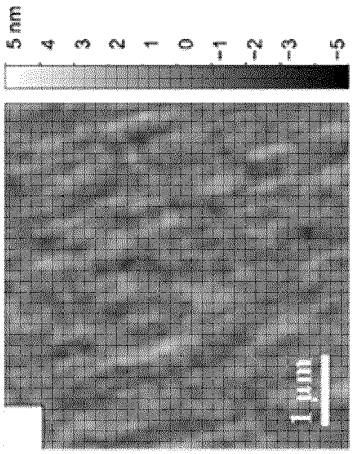


Fig. 14C

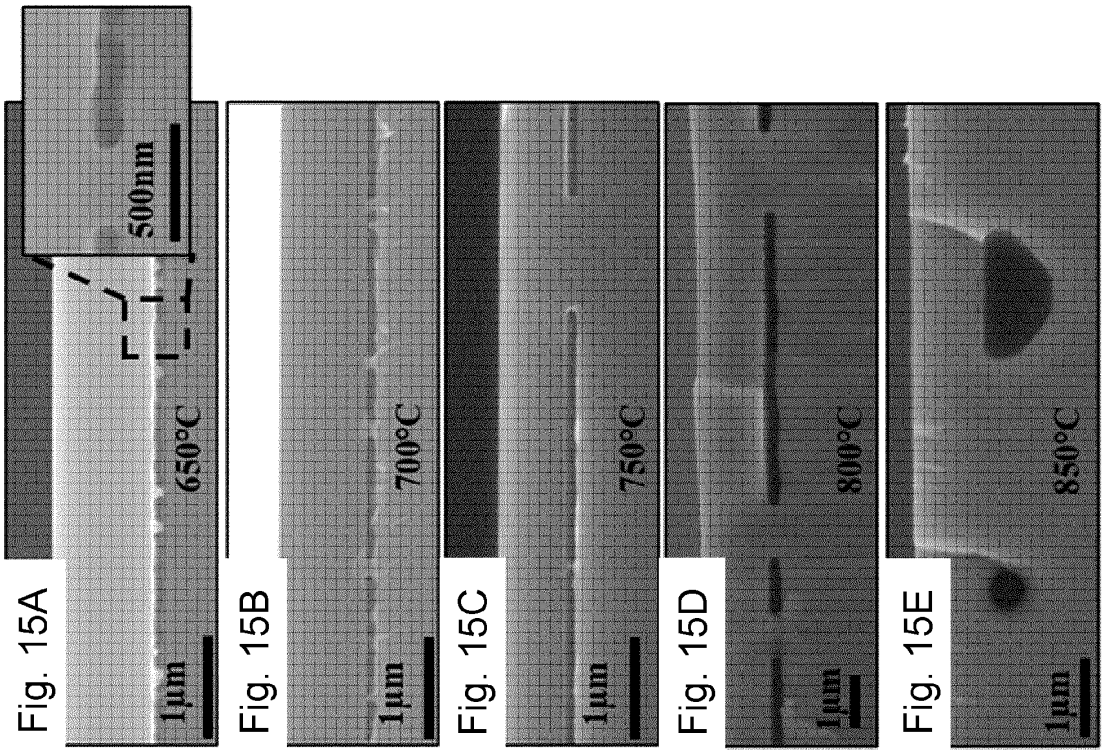


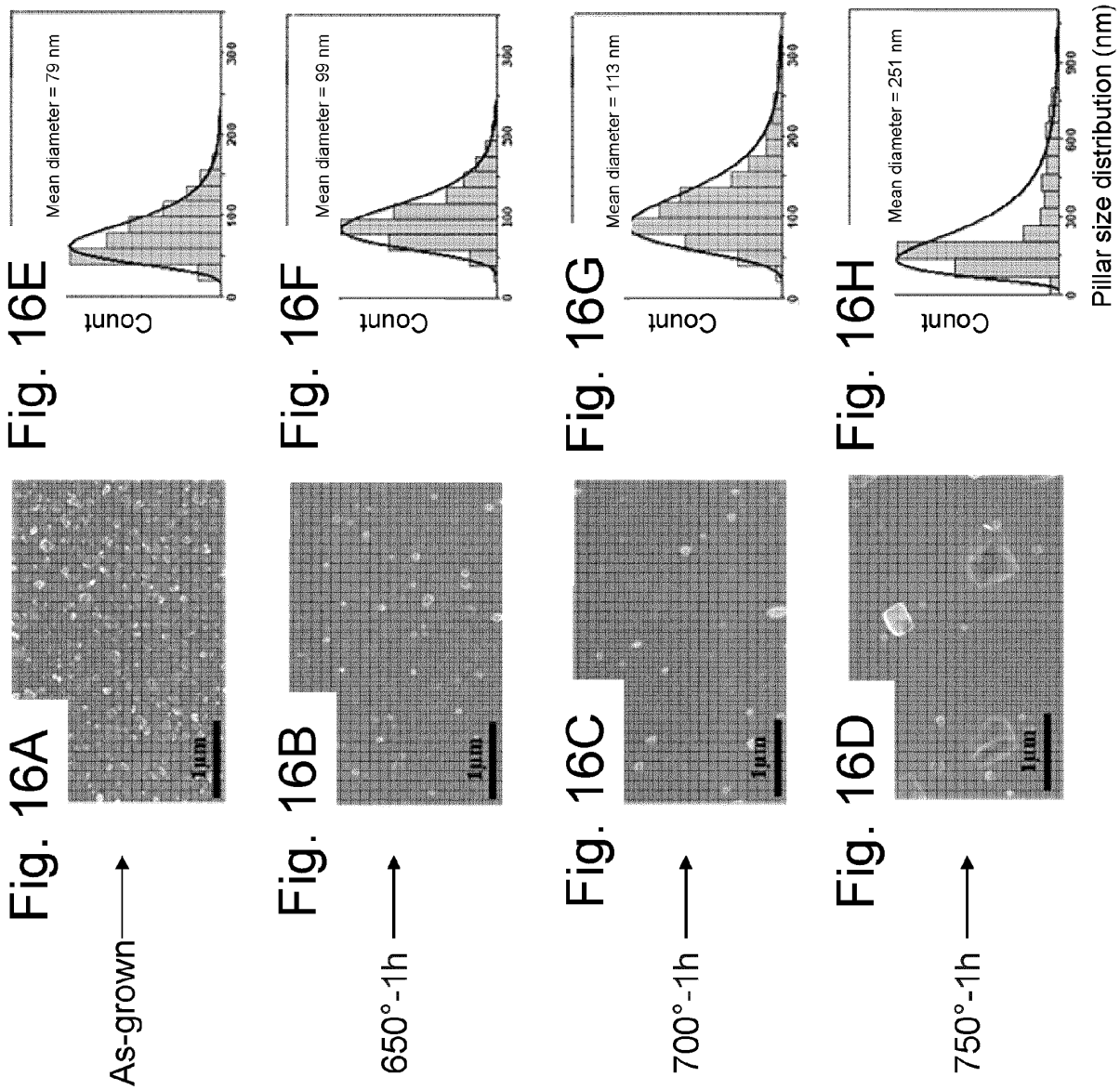
Fig. 15A

Fig. 15B

Fig. 15C

Fig. 15D

Fig. 15E


Fig. 16A
As-grown
1µm
Fig. 16E
Mean diameter = 79 nm
Count
Fig. 16B
650°-1h
1µm
Fig. 16F
Mean diameter = 99 nm
Count
Fig. 16C
700°-1h
1µm
Fig. 16G
Mean diameter = 113 nm
Count
Fig. 16D
750°-1h
1µm
Fig. 16H
Mean diameter = 251 nm
Count
Pillar size distribution (nm)

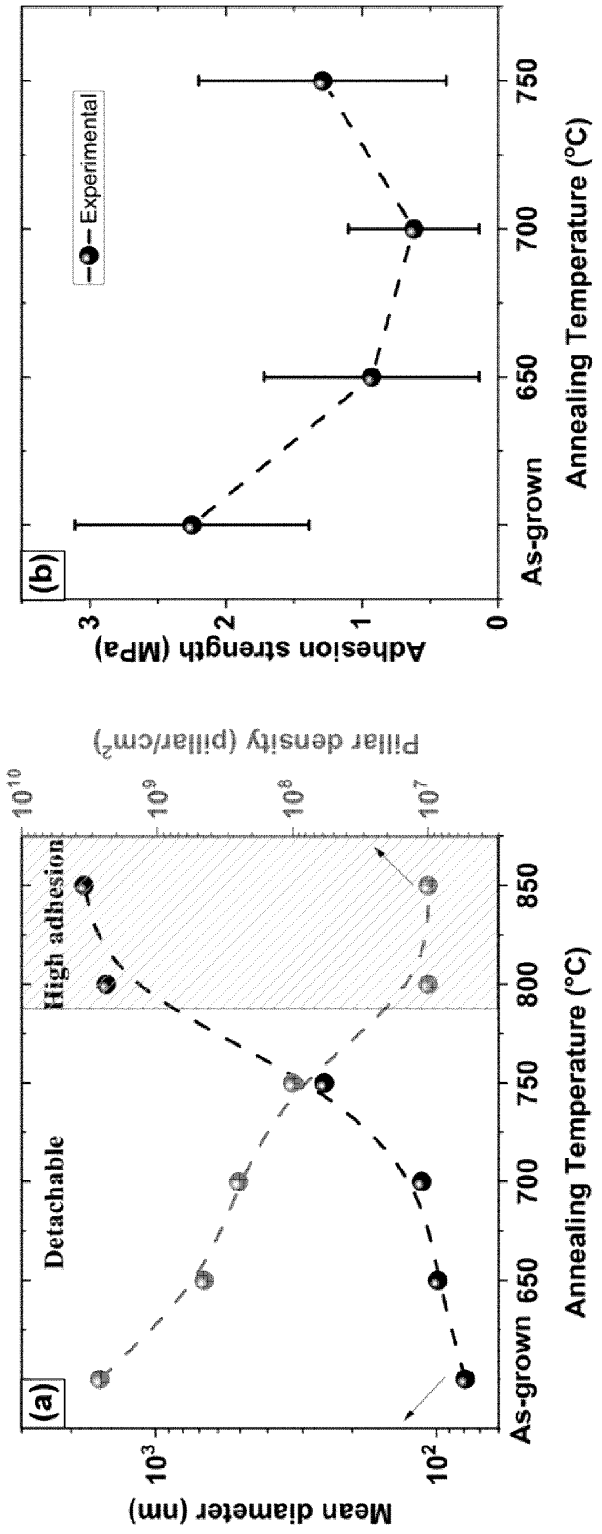


Fig. 17A

Fig. 17B

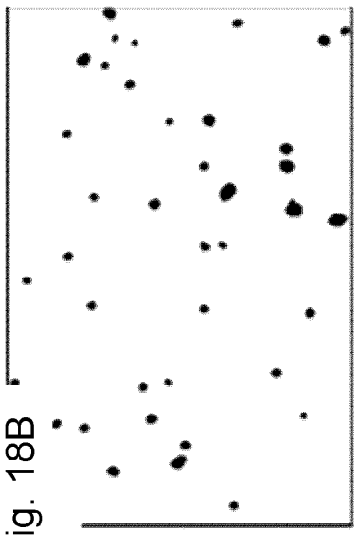


Fig. 18B

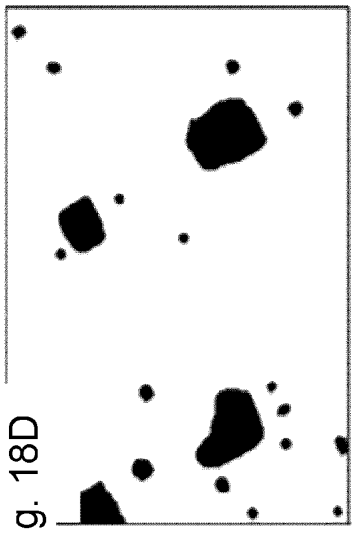


Fig. 18D

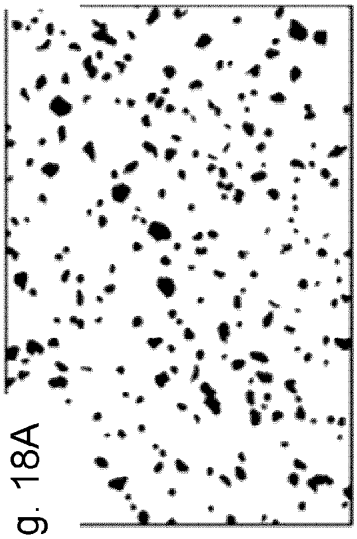


Fig. 18A

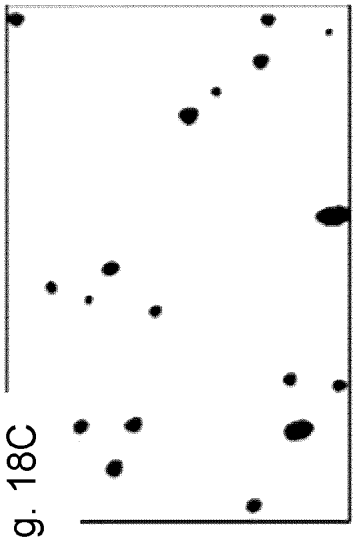


Fig. 18C

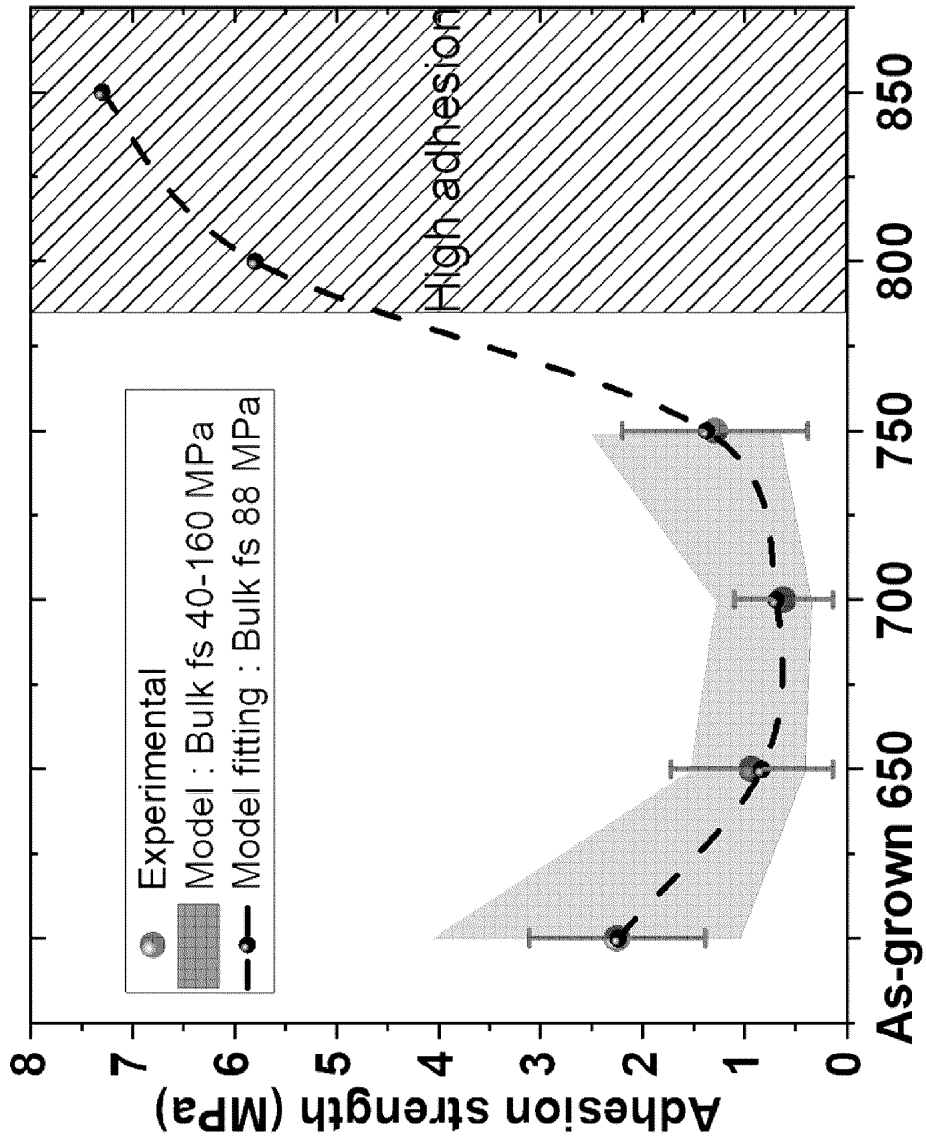

Adhesion strength (MPa)
0
1
2
3
4
5
6
7
8
As-grown
650
700
750
800
850
Annealing Temperature (°C)
High adhesion
Experimental
Model : Bulk fs 40-160 MPa
Model fitting : Bulk fs 88 MPa

Fig. 19

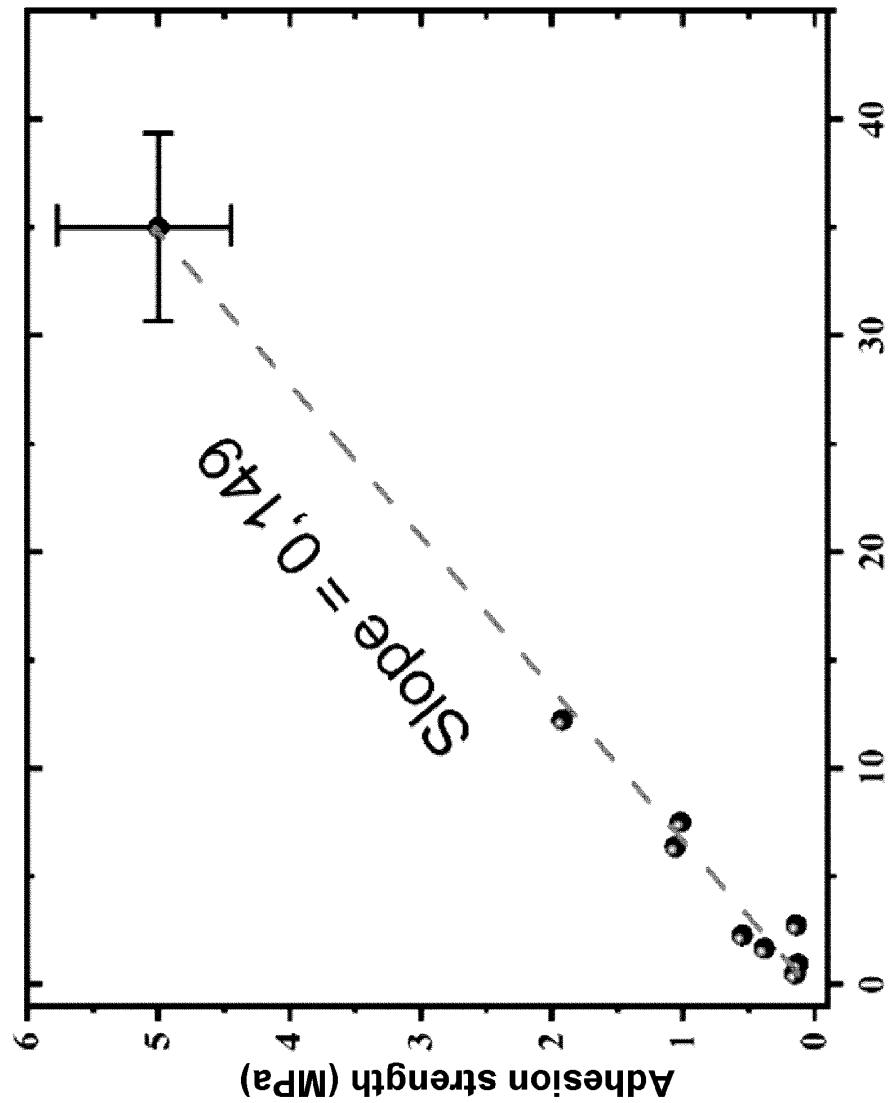

Adhesion strength (MPa)
Pillar surface coverage (%)
Slope = 0,149
0
1
2
3
4
5
6
0
10
20
30
40

Fig. 20