

Figure 1A

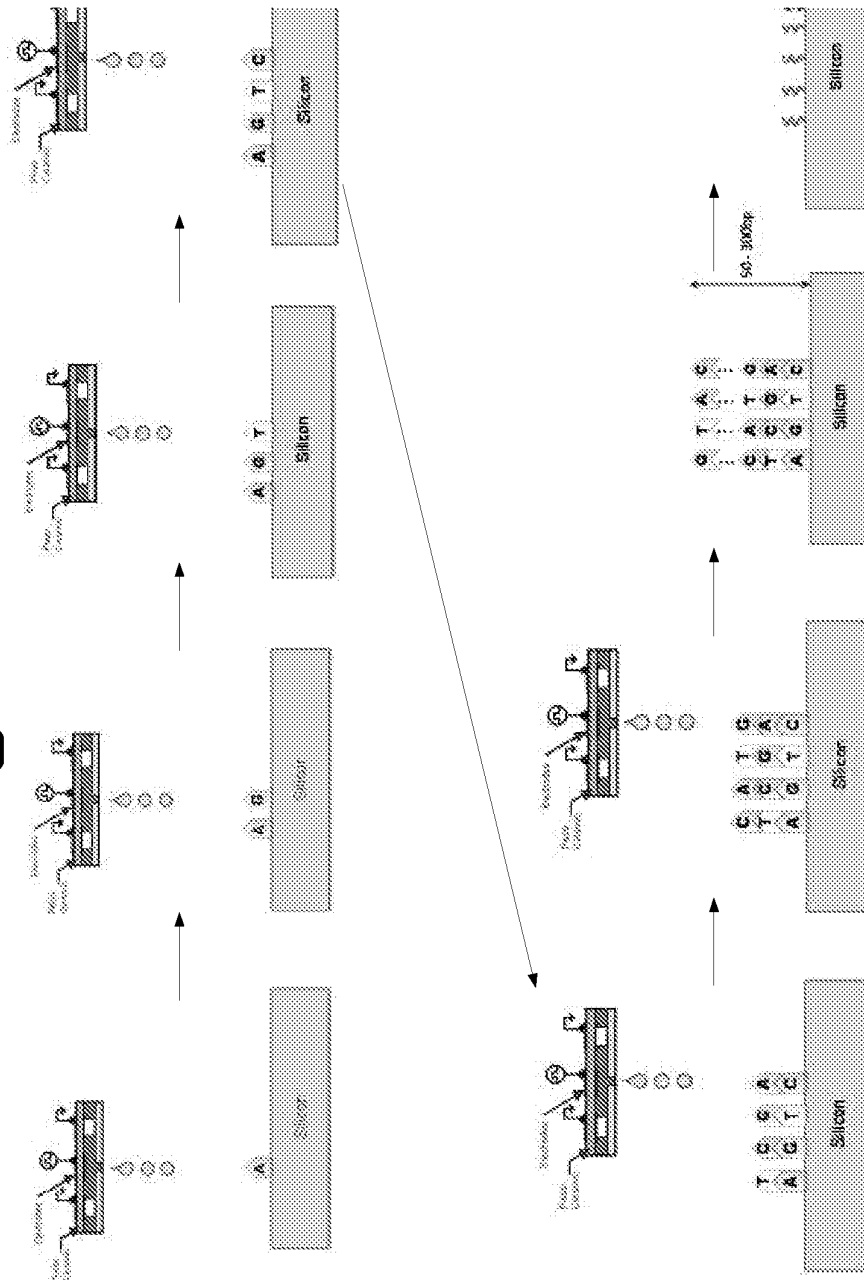


Figure 1 B

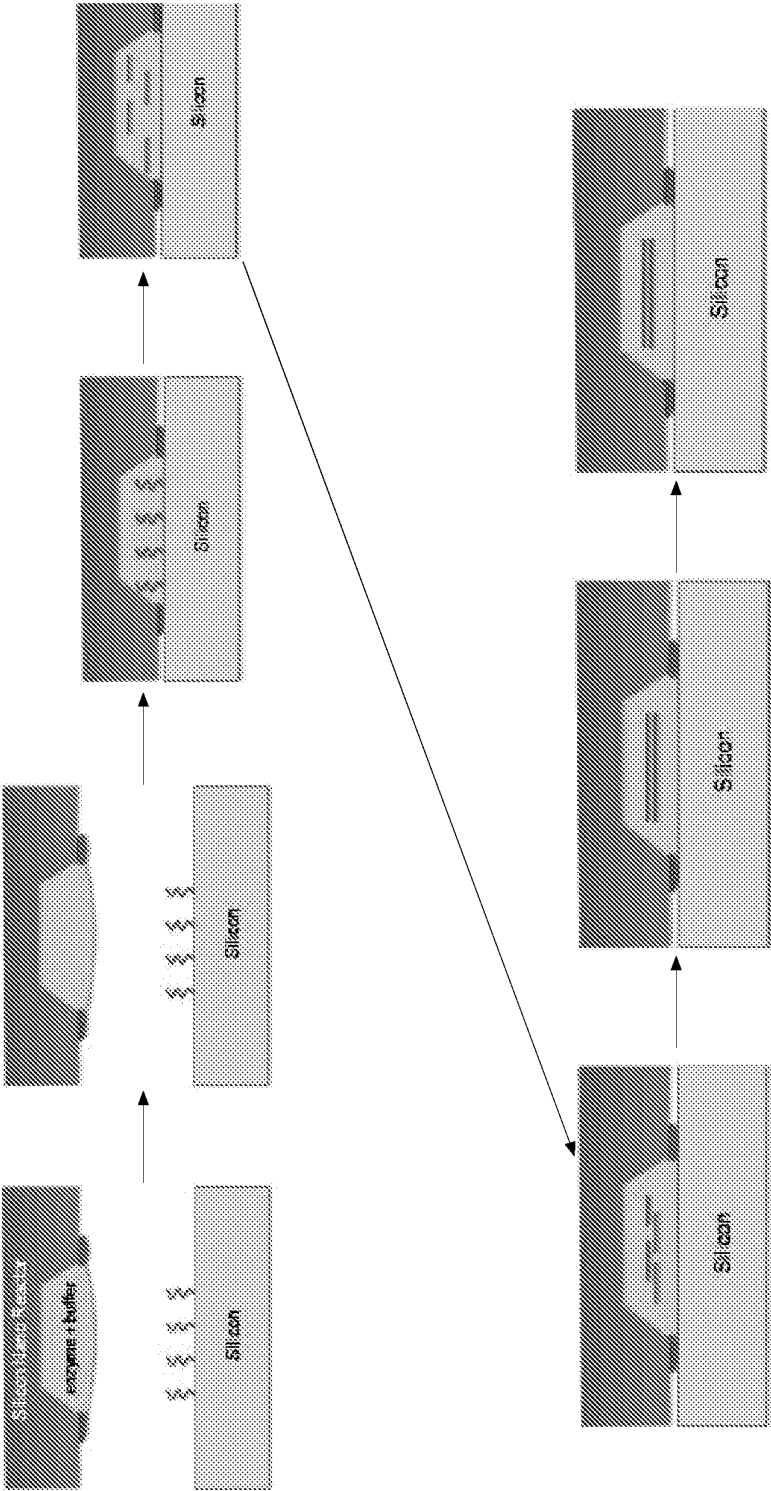


Figure 1 C

Gene Printing and NanoReactor Technology

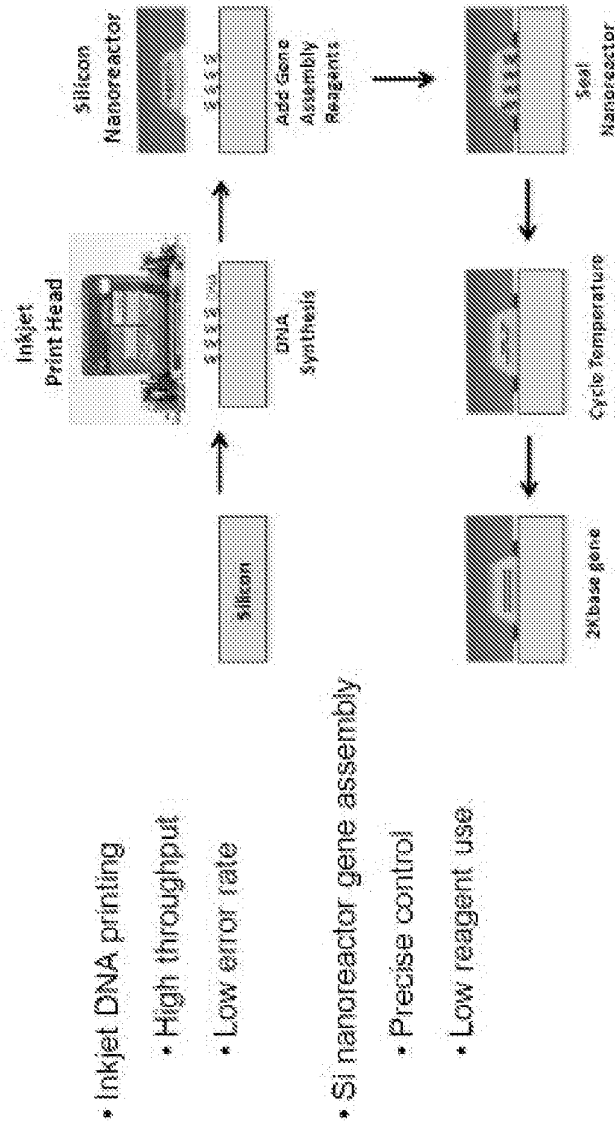


Figure 2 A

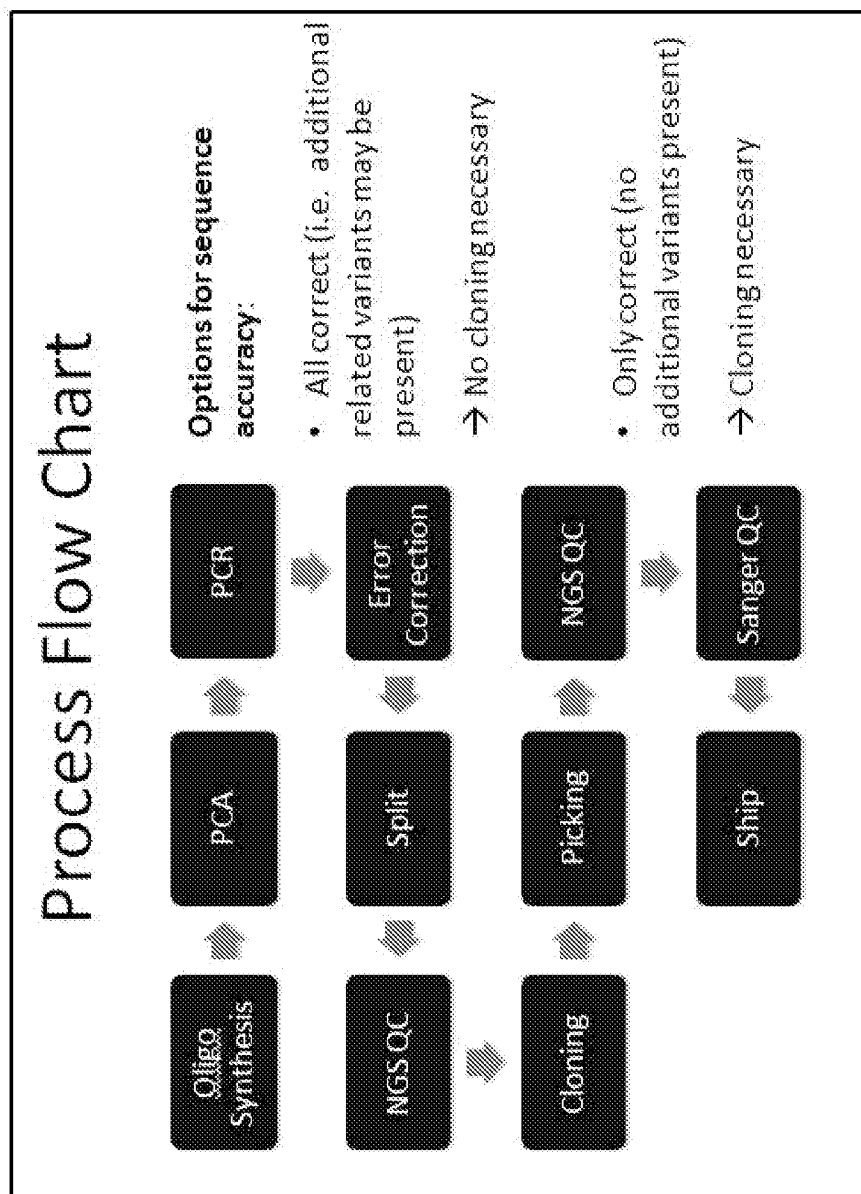


Figure 2 B

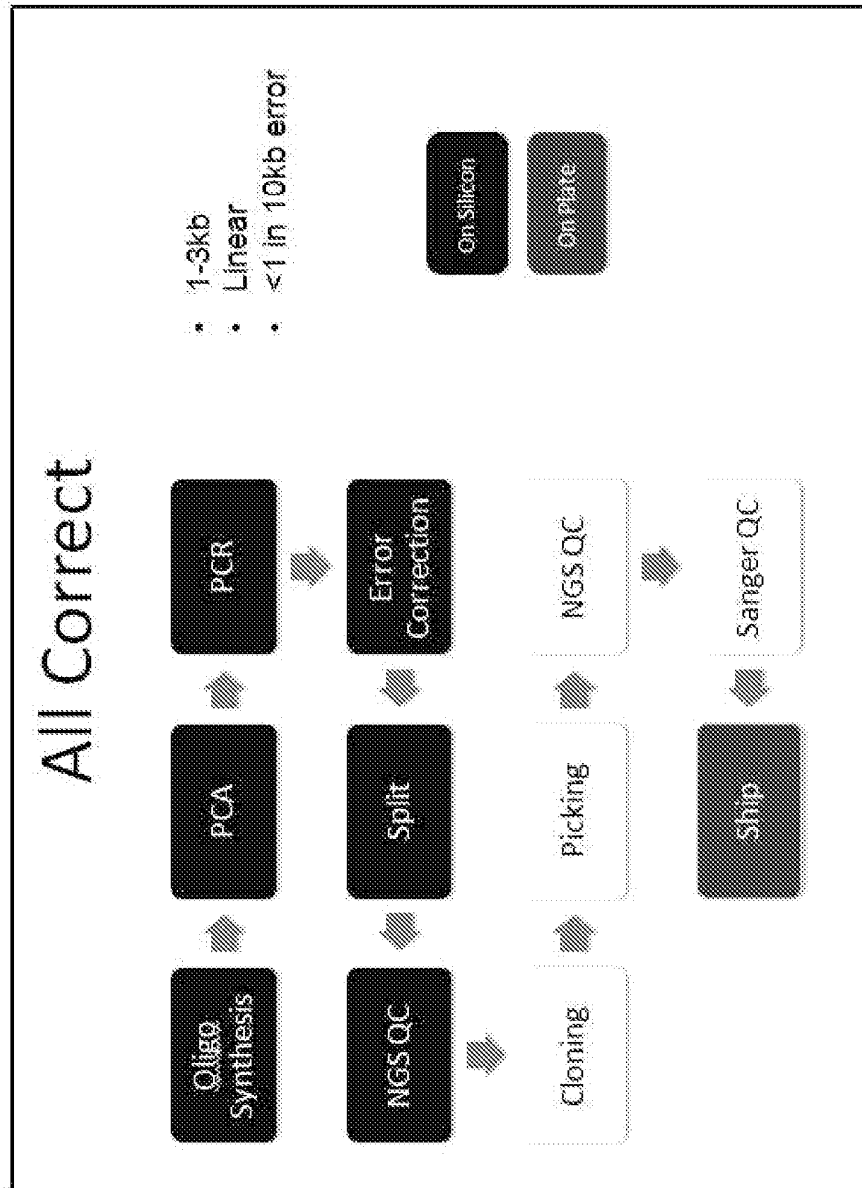


Figure 2 C

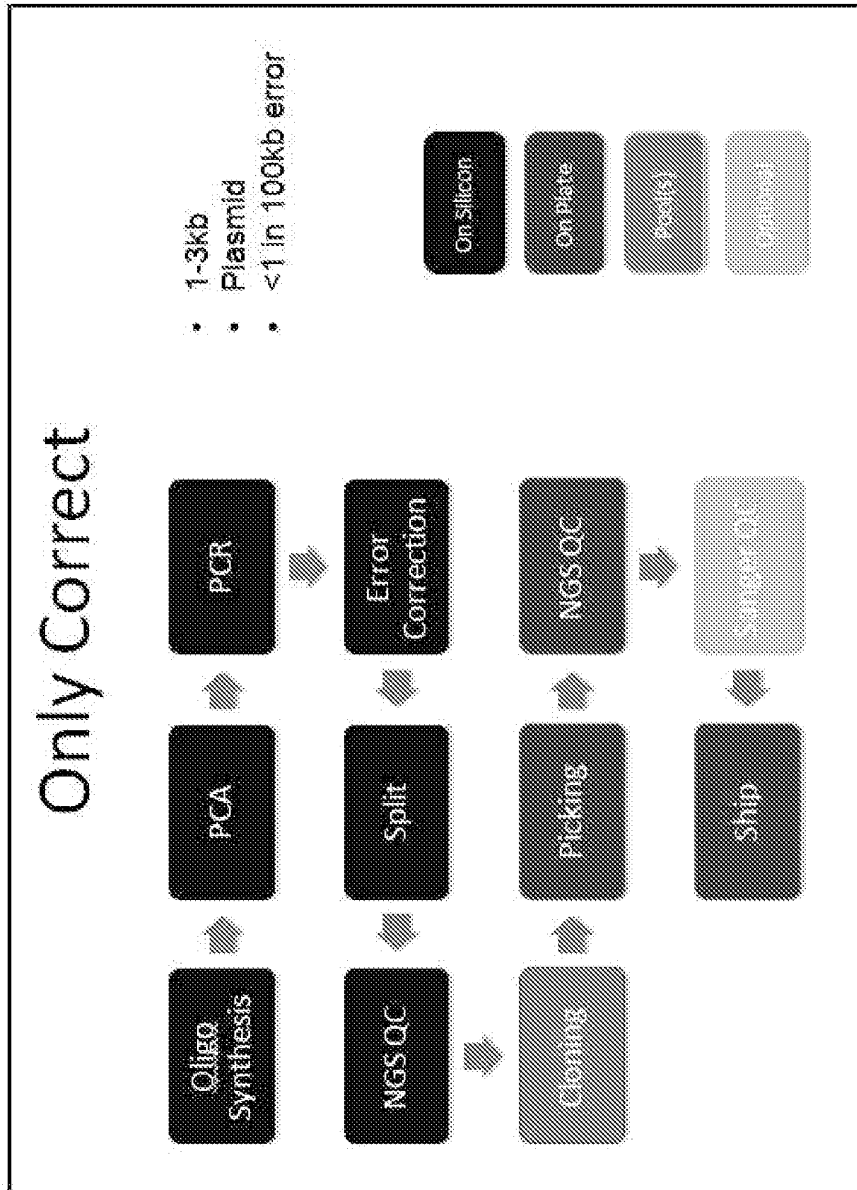


Figure 3

Oligo Printer

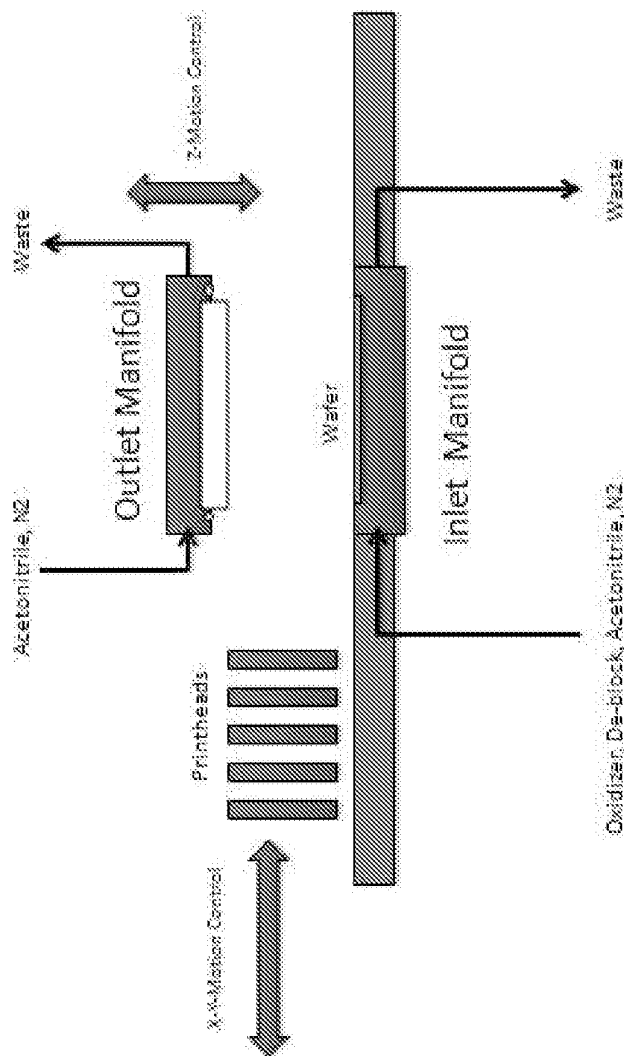


Figure 4

Oligo Wafer Reactor

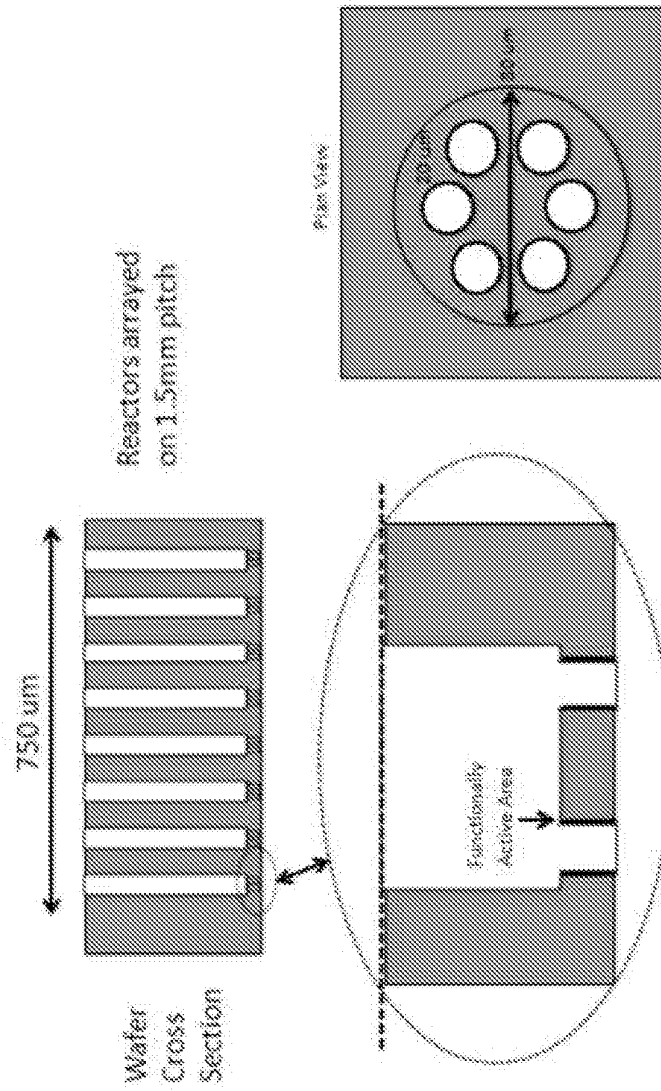


Figure 5

Reagent Deposition

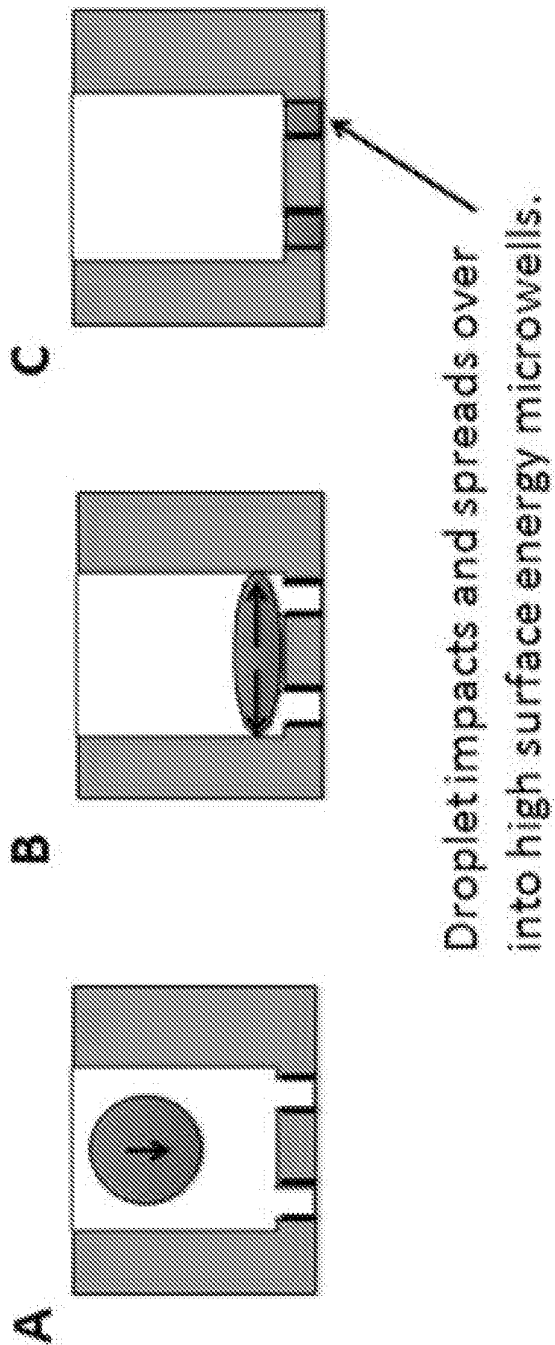


Figure 6A

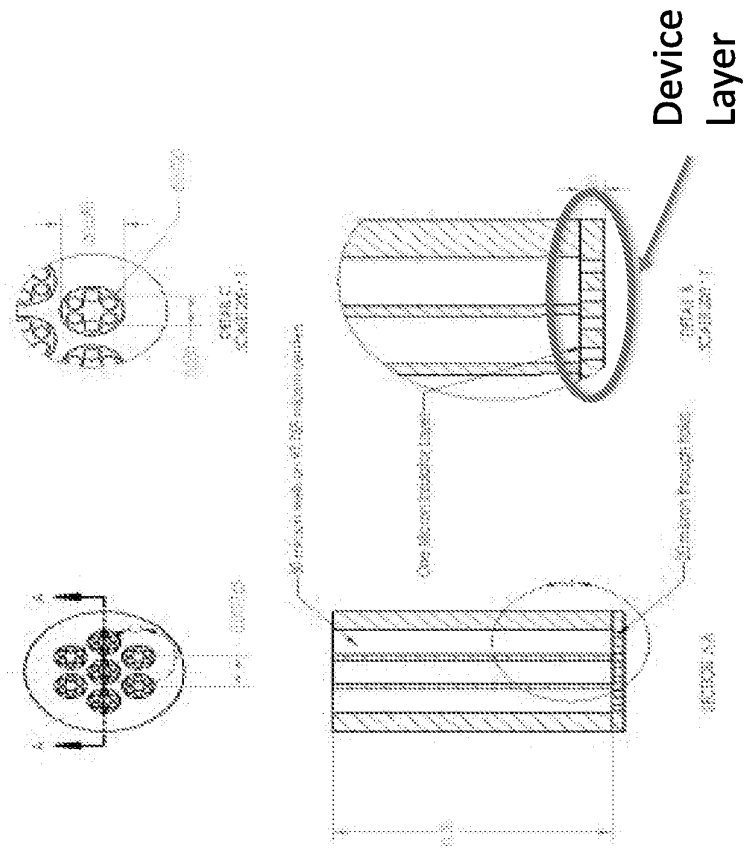


Figure 6B

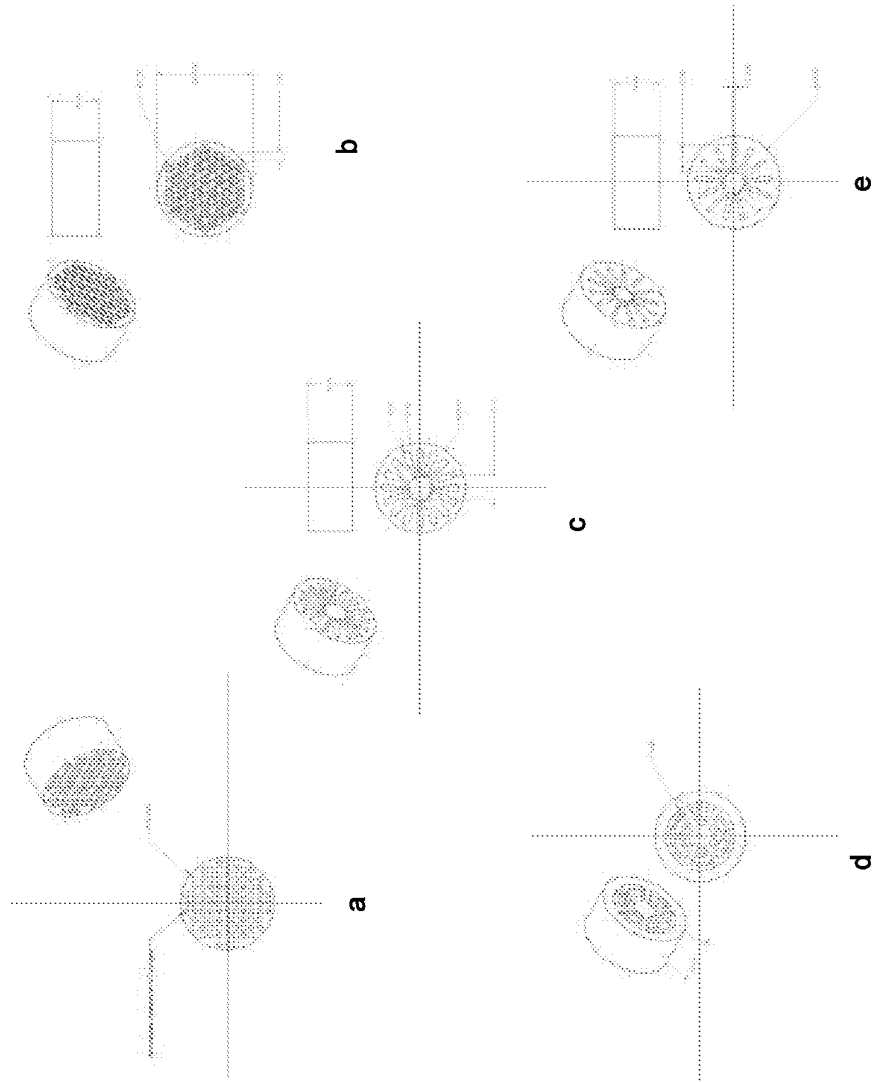


Figure 6C
Wafer Layout

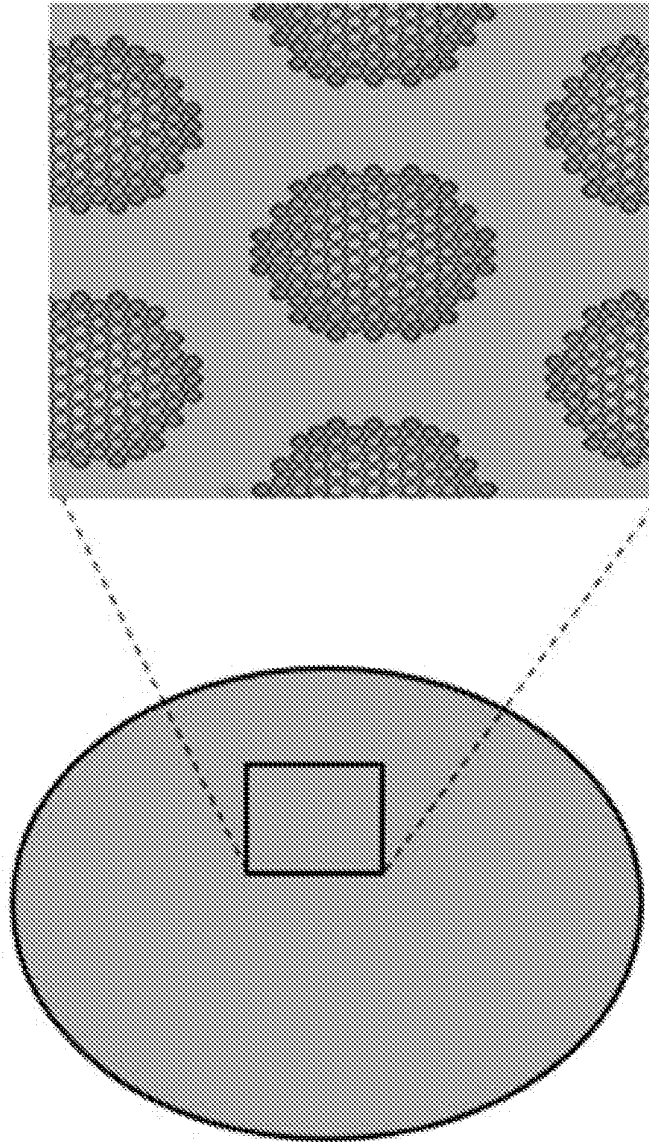


Figure 7

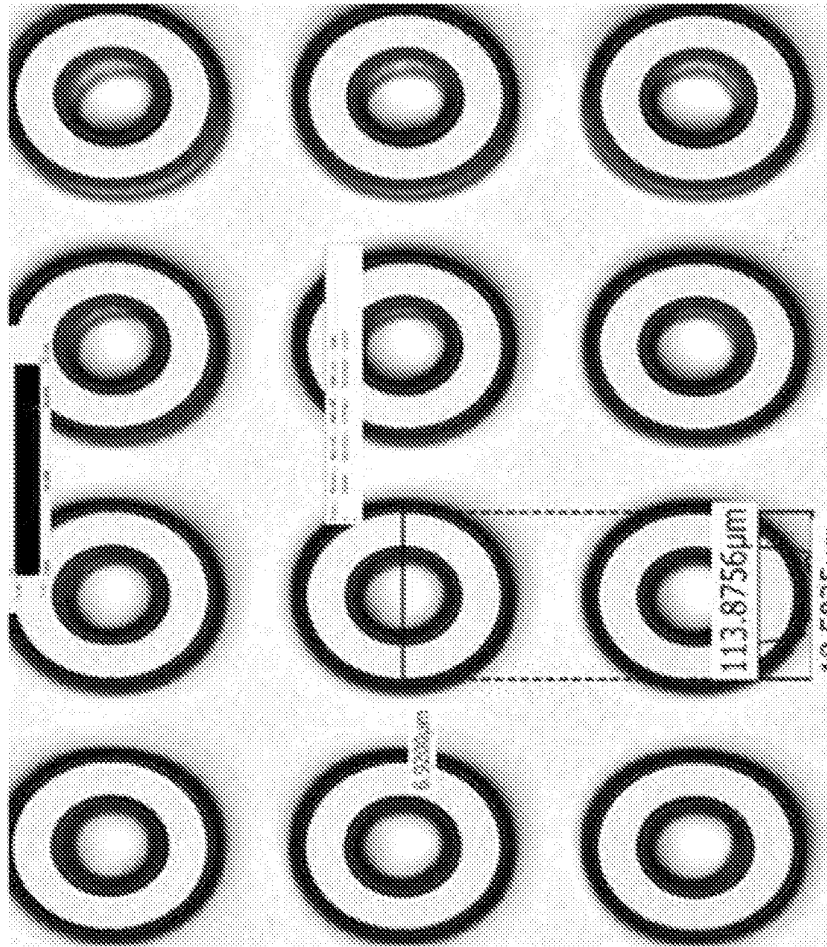


Figure 8

Process Workflow

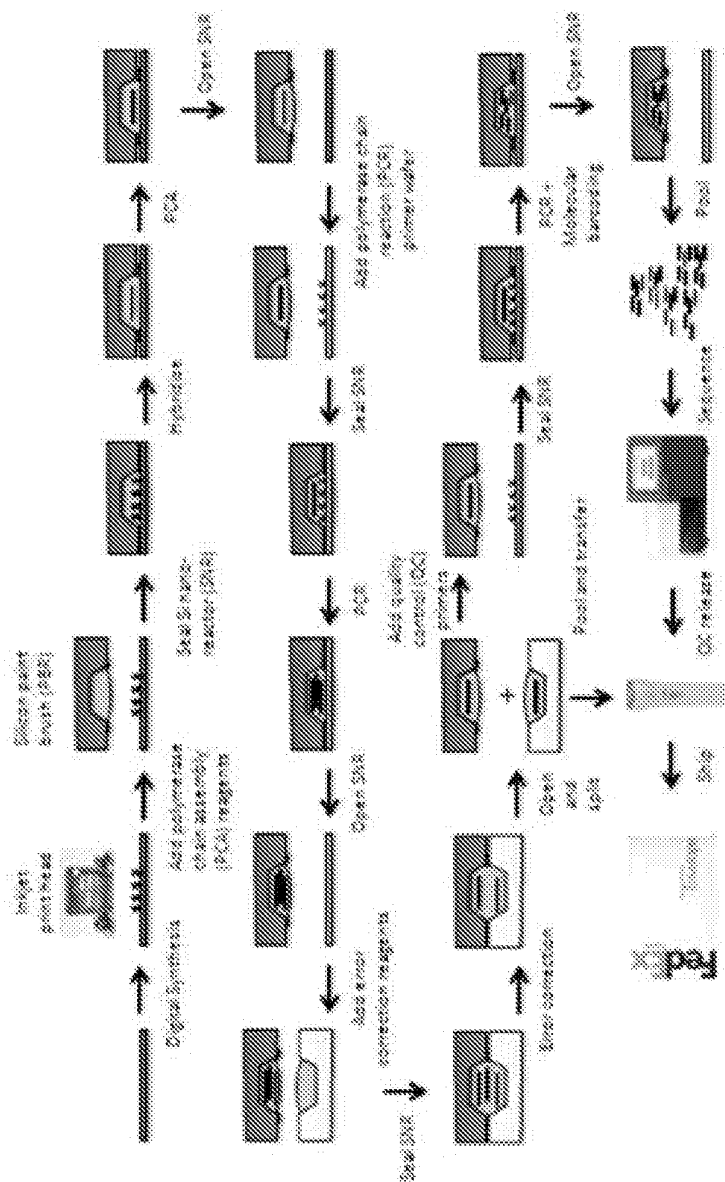


Figure 9

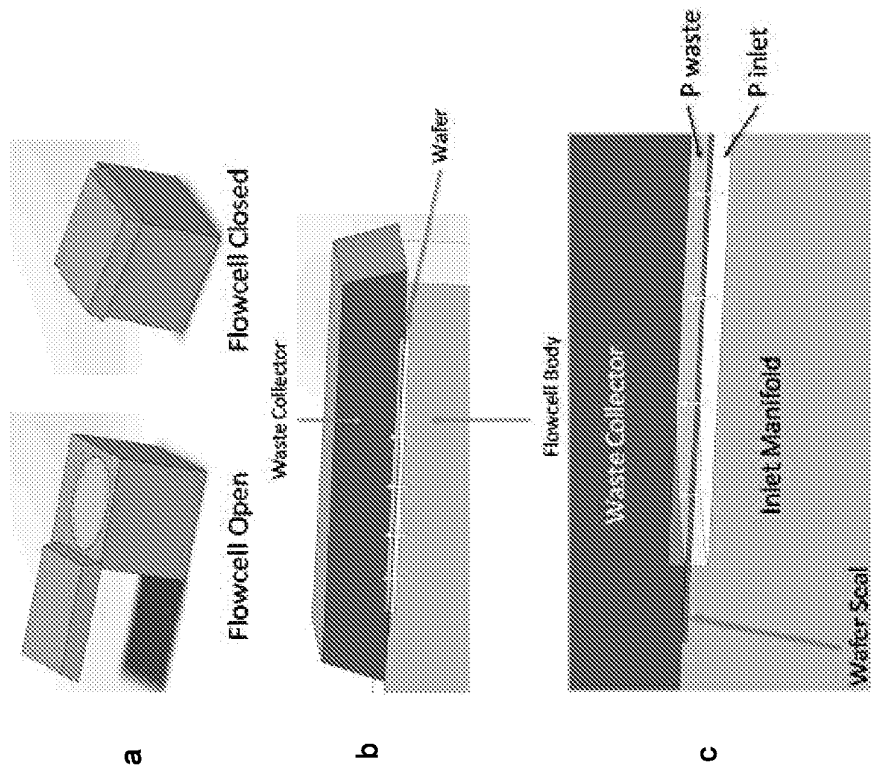


Figure 10

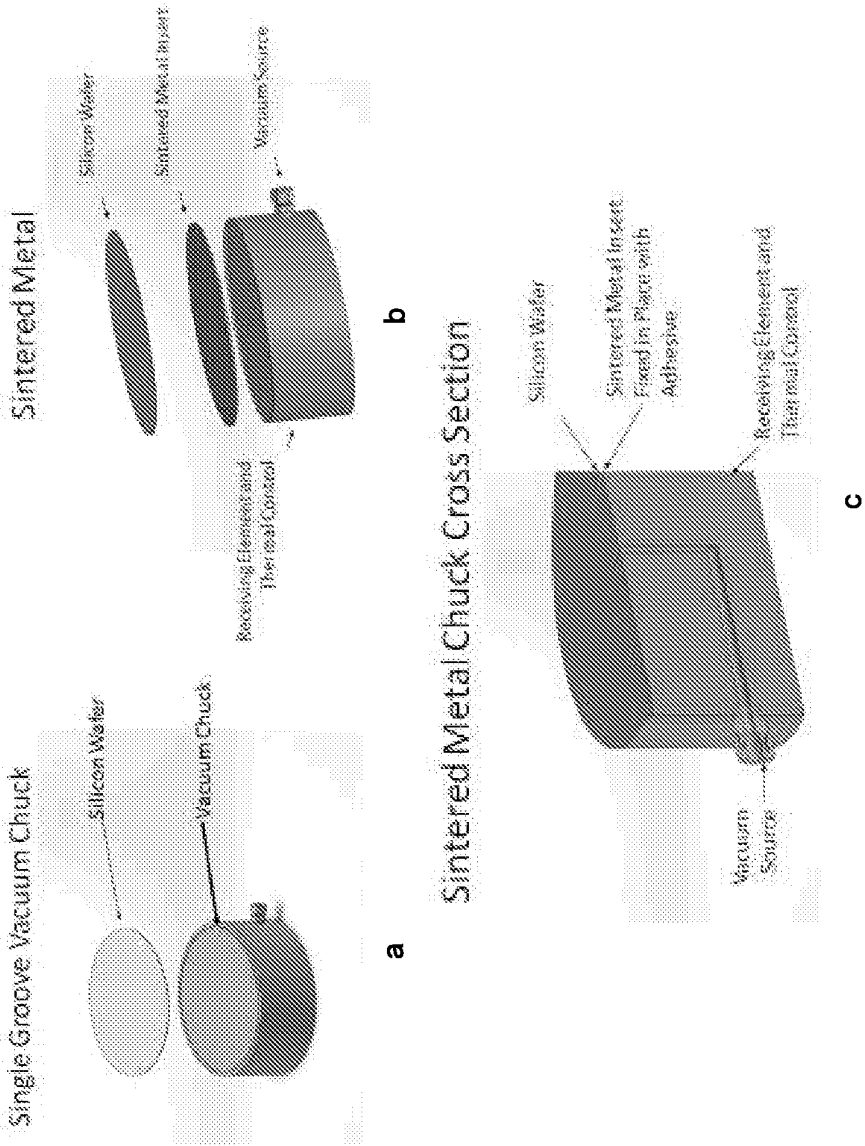


Figure 11

Standard Phosphoramidite Chemistry

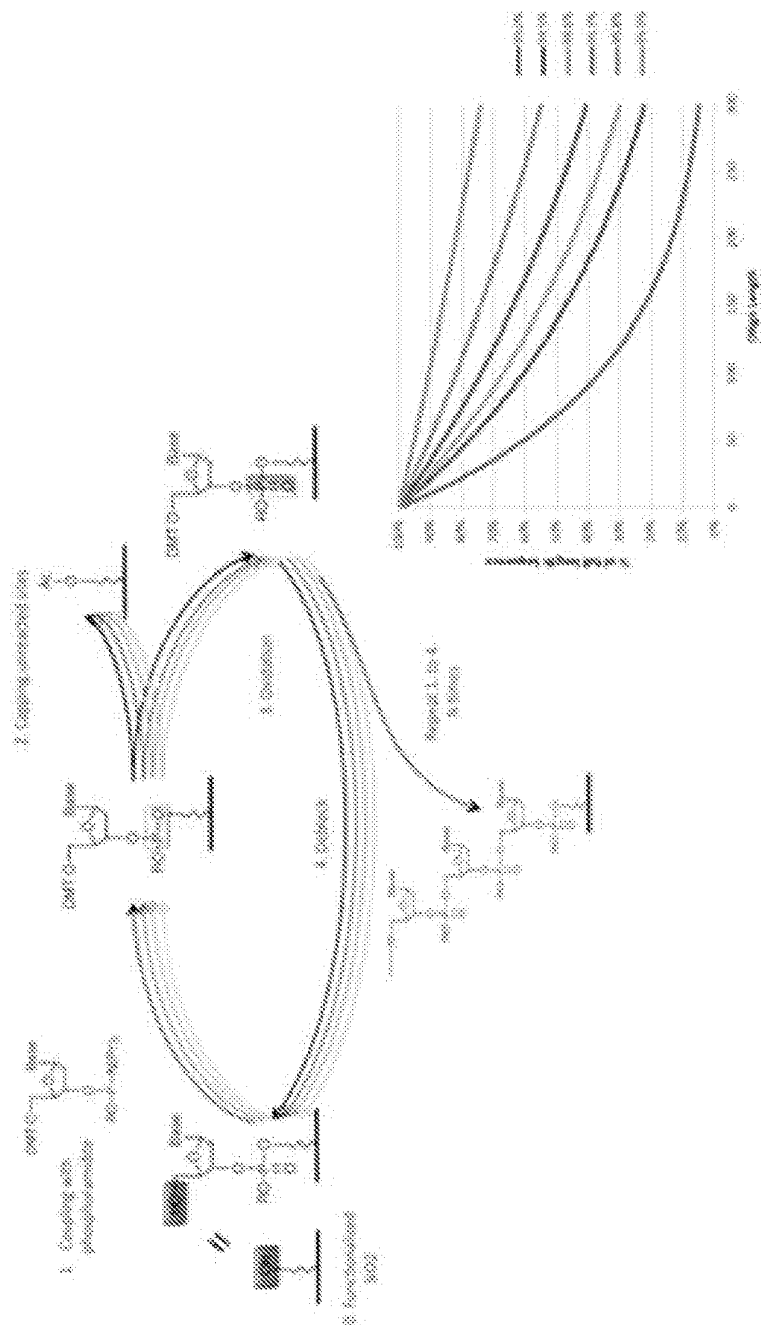


Figure 12
Polymerase Chain Assembly

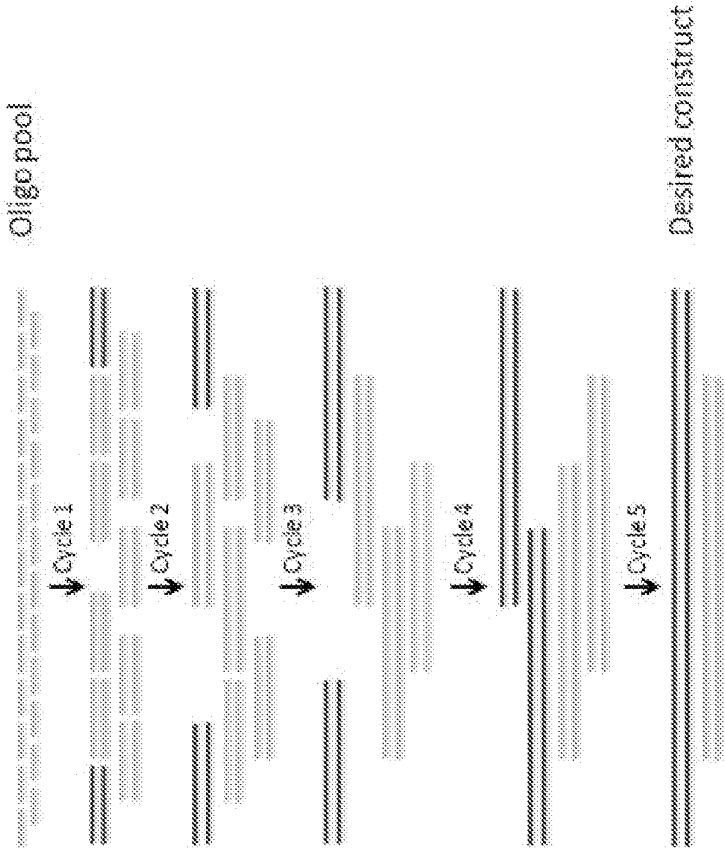


Figure 13 Advantage of Long Oligos

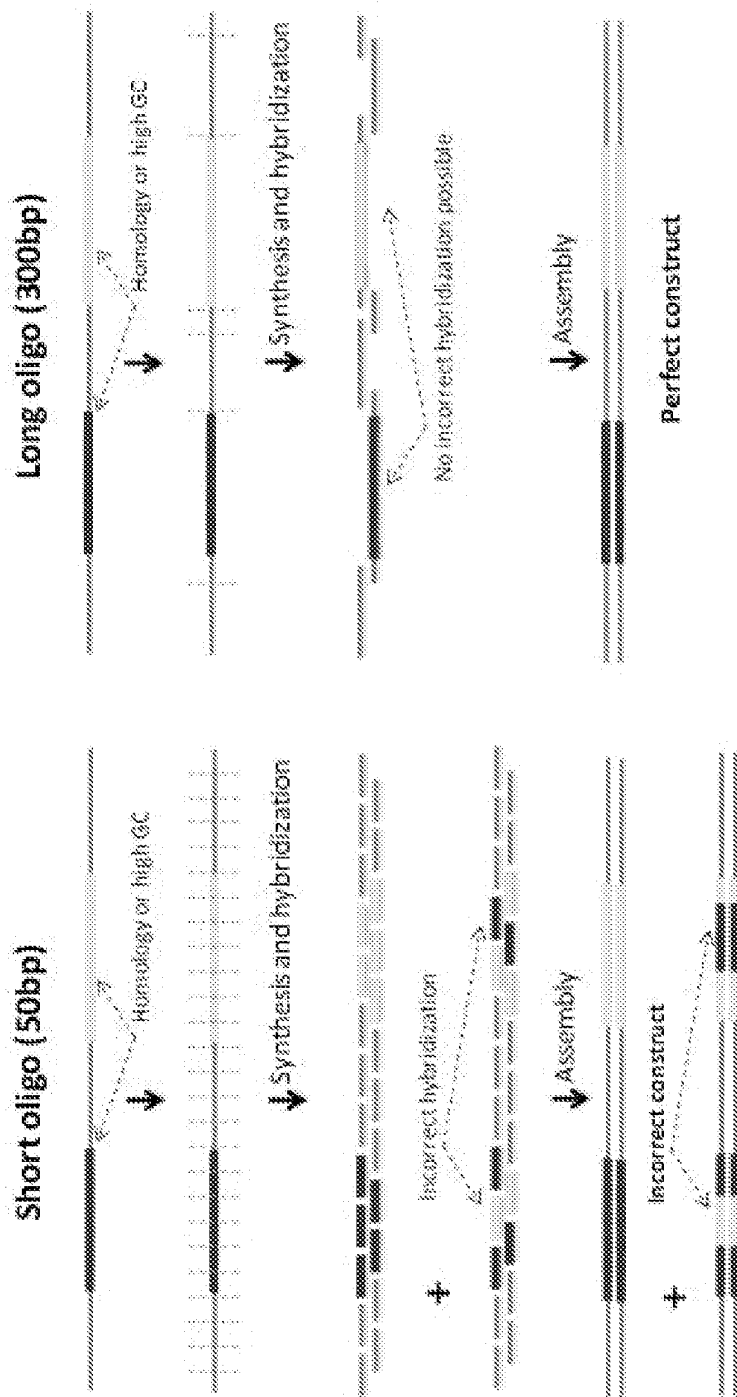


Figure 14
PCA + Gibson: 2-10Kb assembly

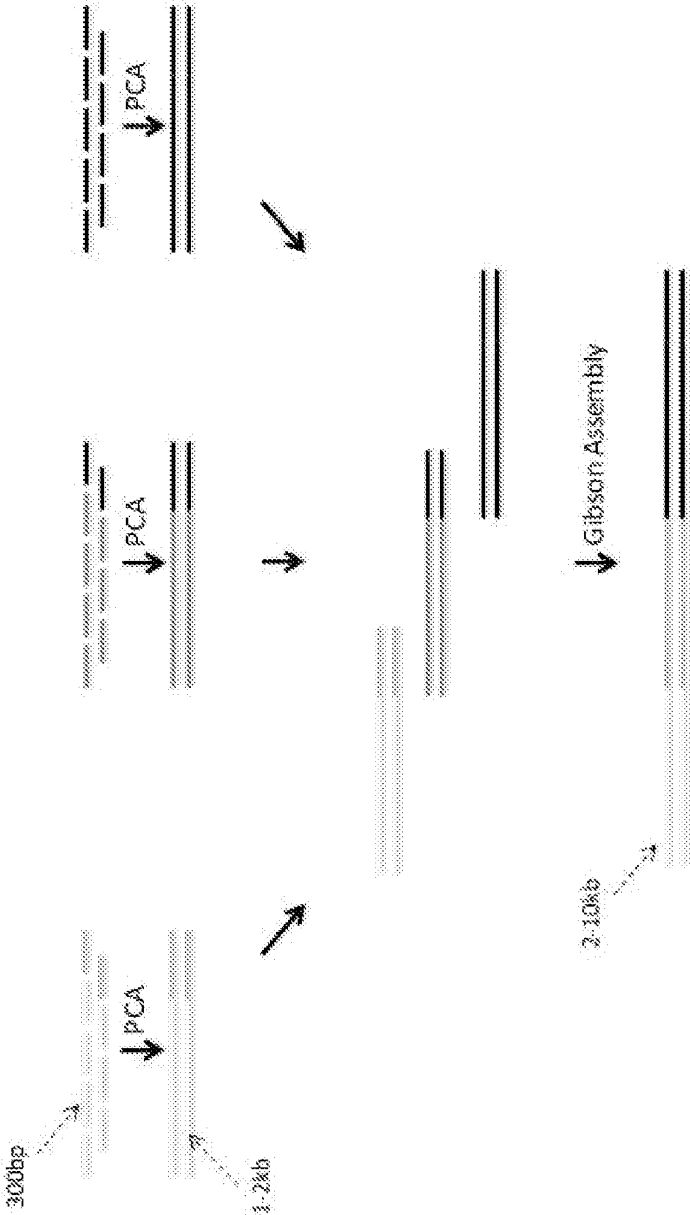


Figure 15

Error Correction: High Error Rate

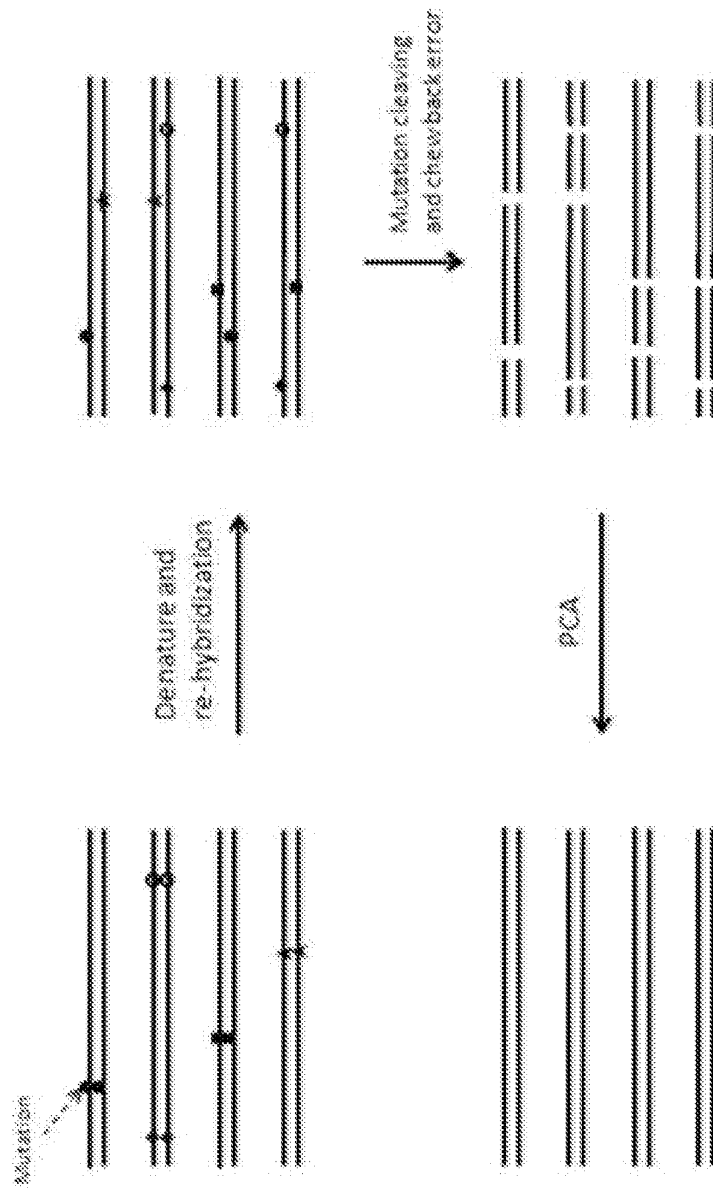


Figure 16

Error Correction: Low Error Rate

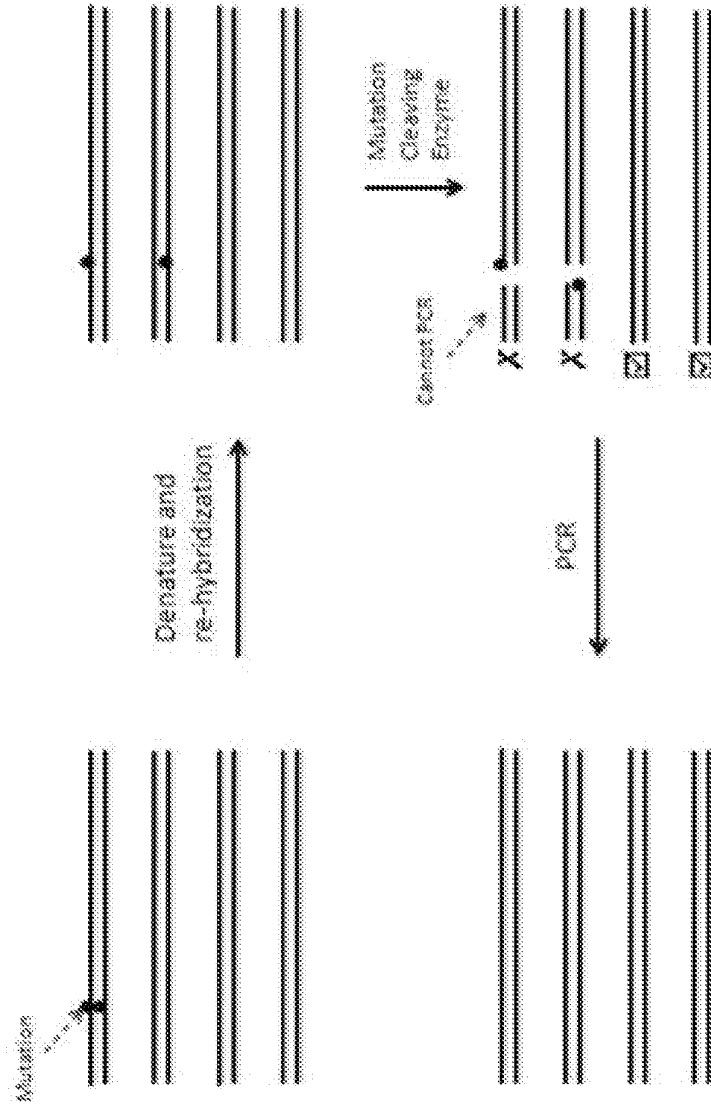


Figure 17

Molecular Barcoding & NGS QC

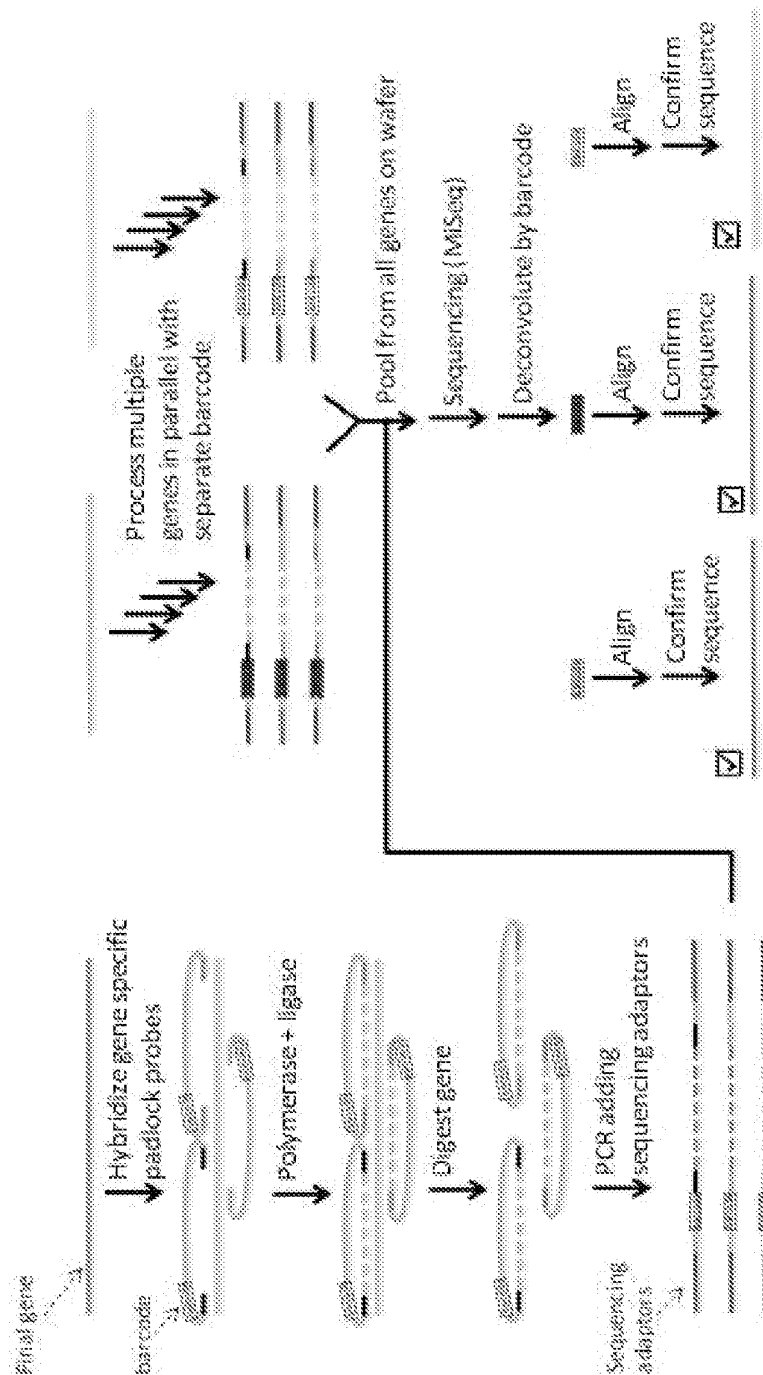
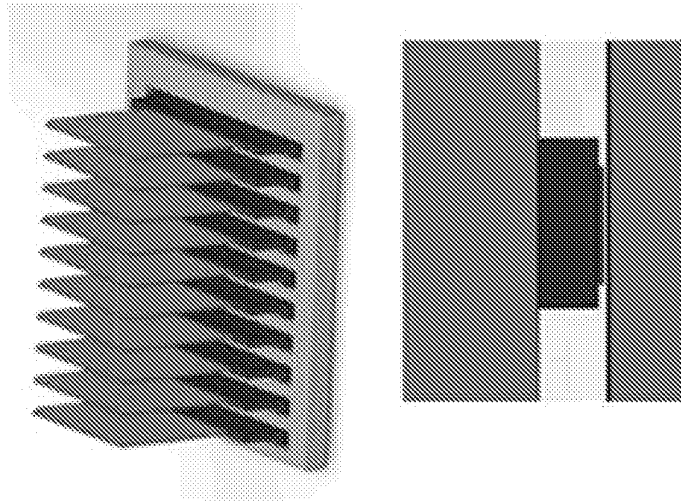


Figure 18

Inkjet Assembly



- Inkjet assembly of 10 heads
- Inkjet heads have Silicon orifice plates with 256 nozzles on 254um centers
- 100 micron fly height
- Each head needs access to each well that traverses

Figure 19

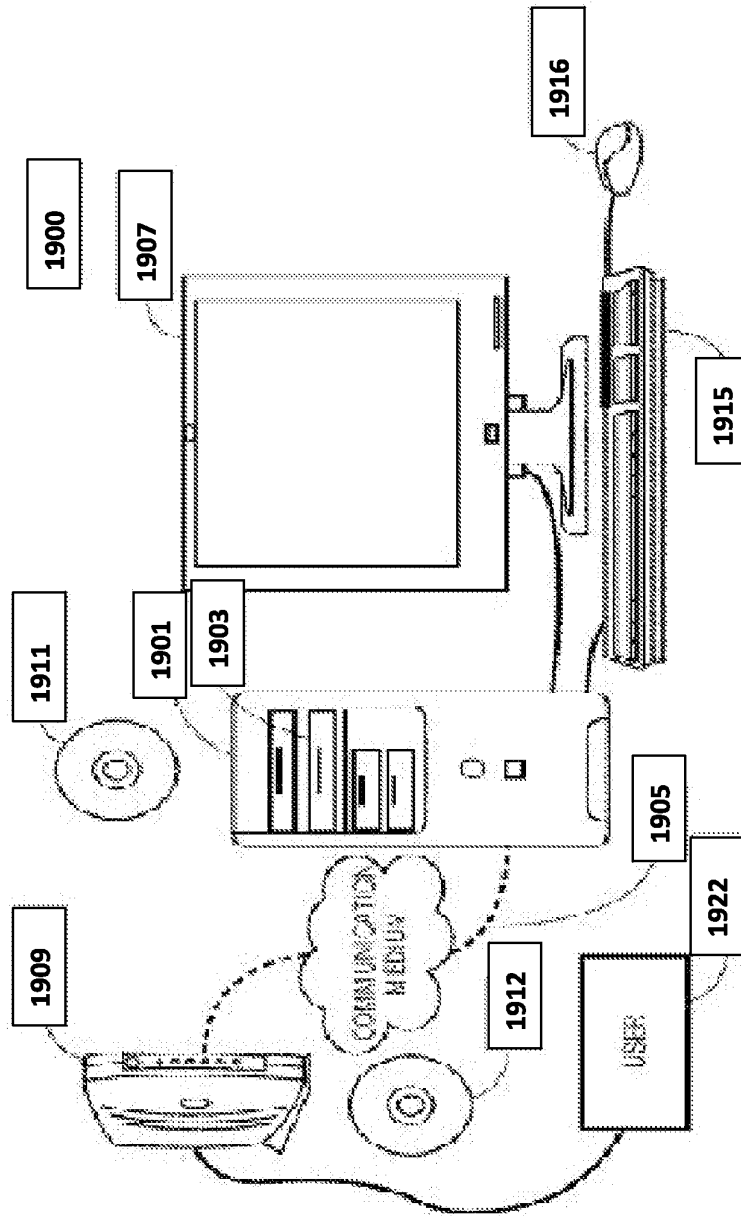


Figure 20

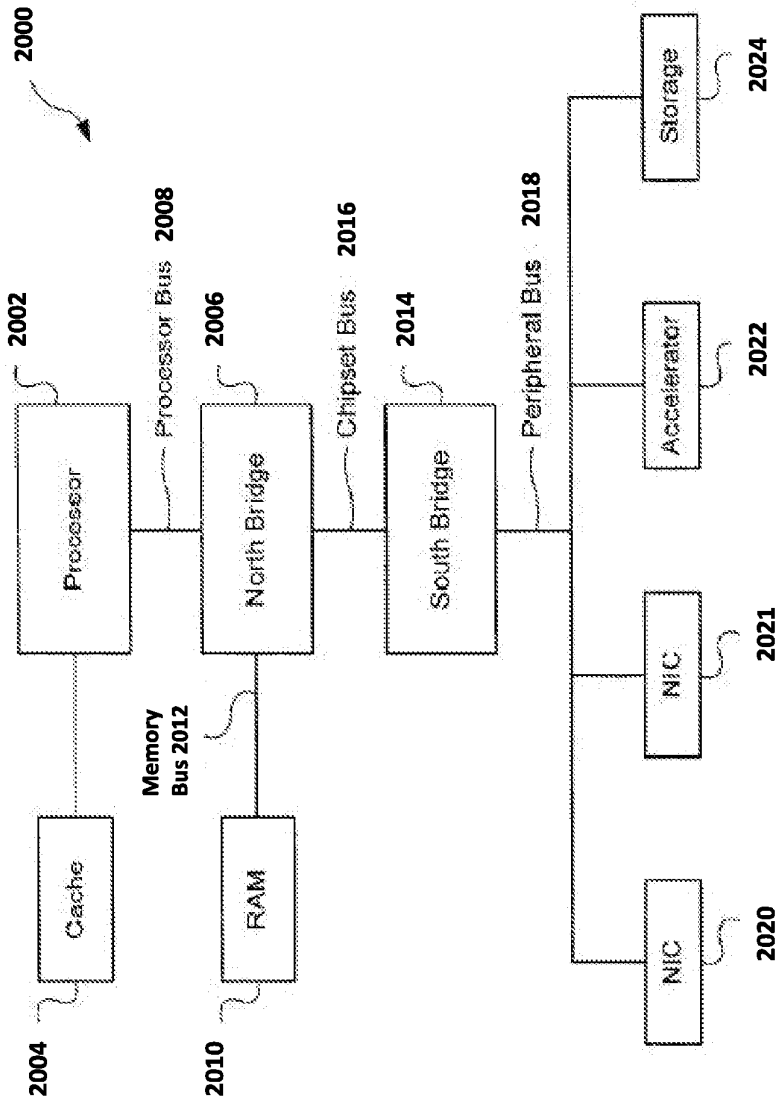


Figure 21

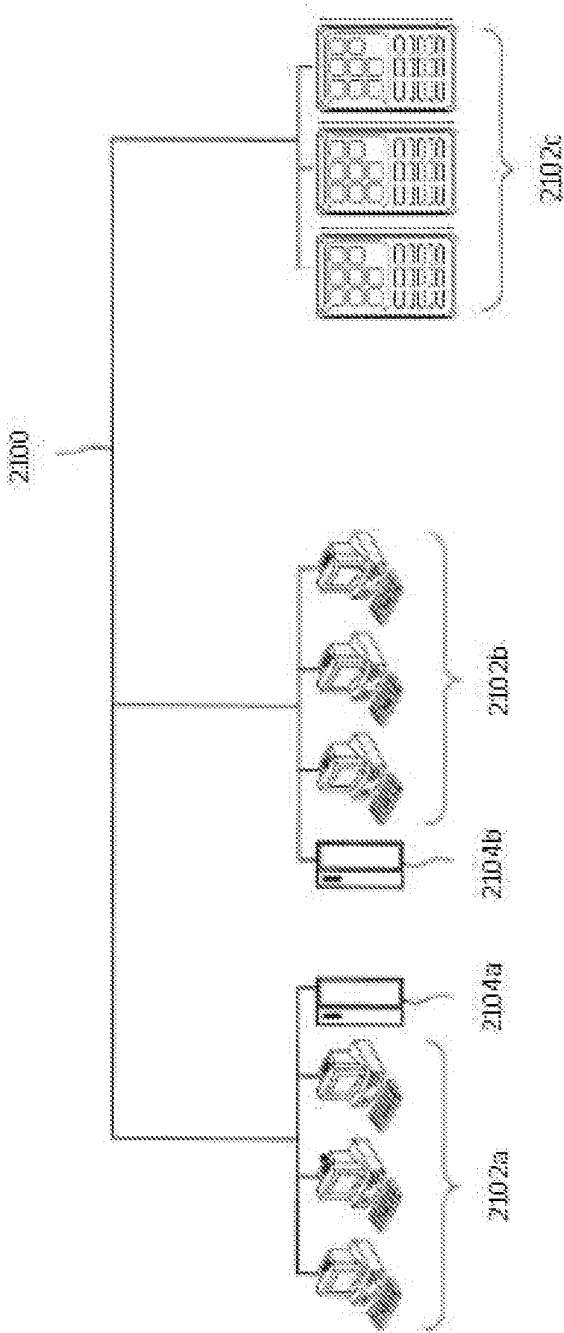


Figure 22

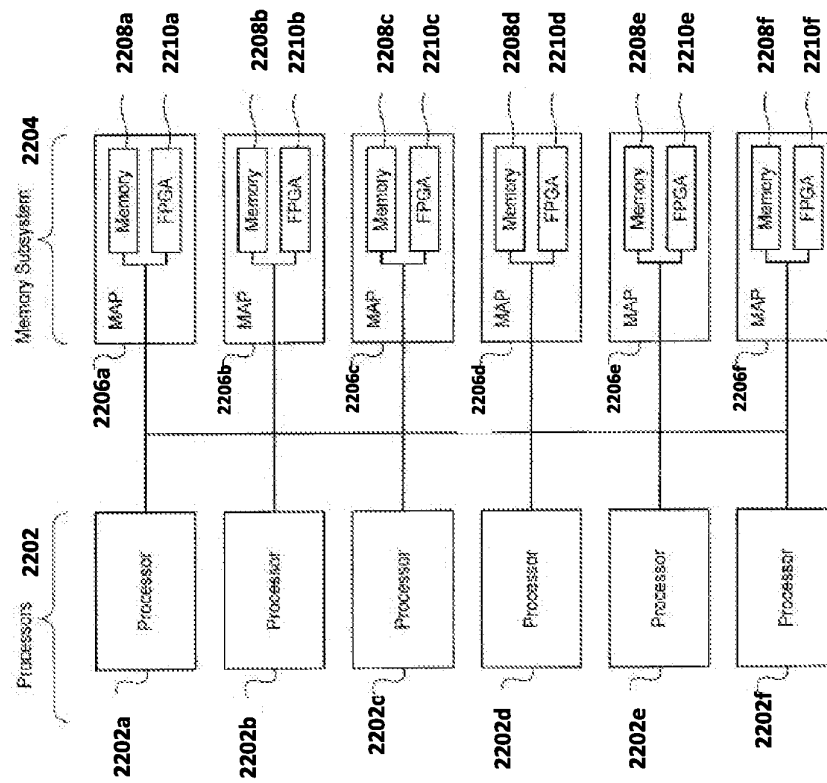


Figure 23

Front-End Processing

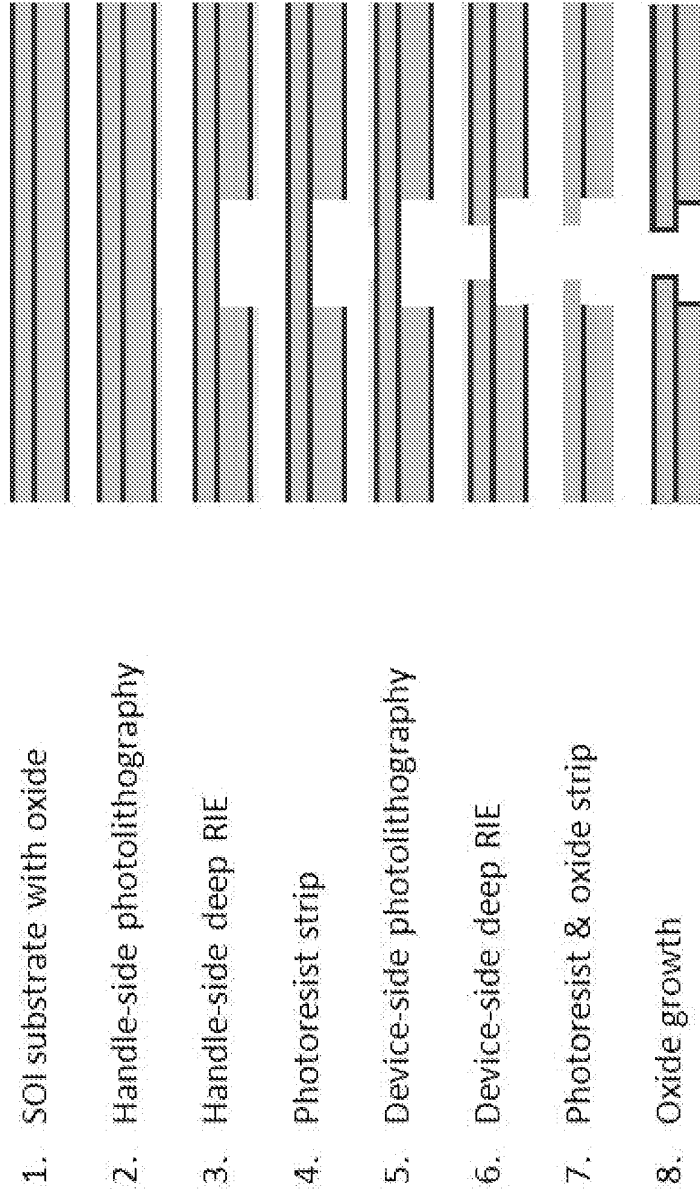


Figure 24

Back-End Processing

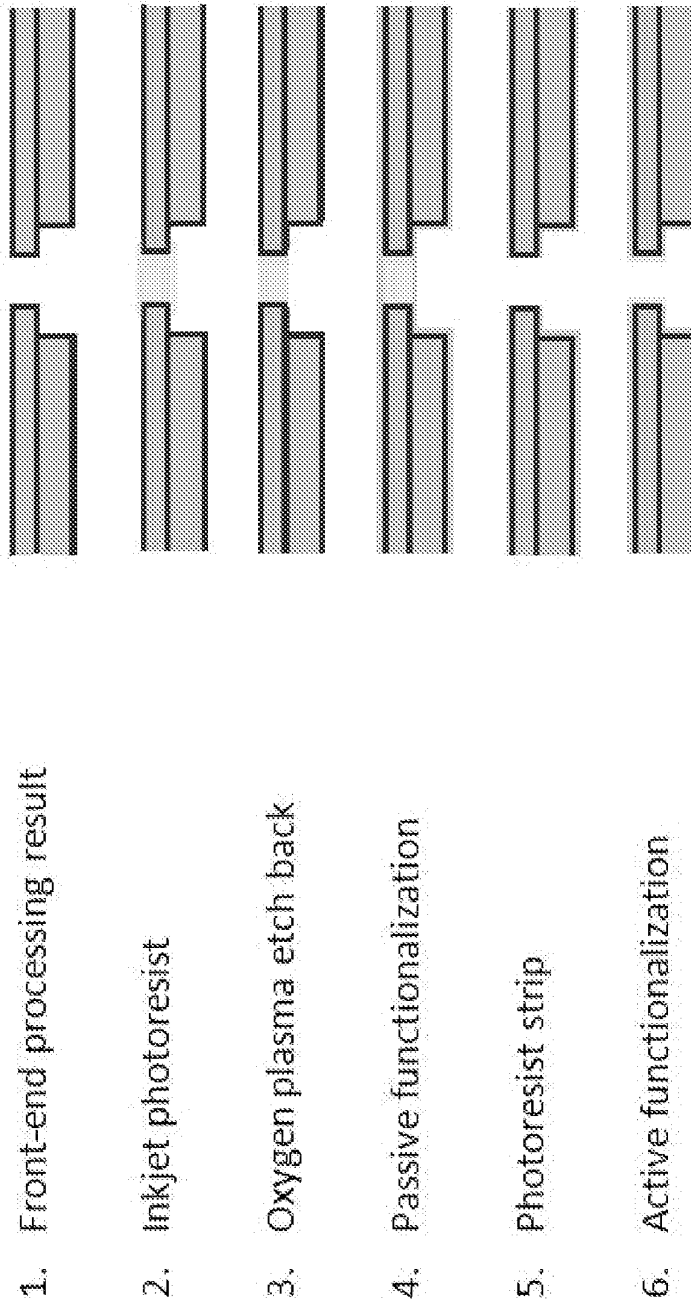


Figure 25A

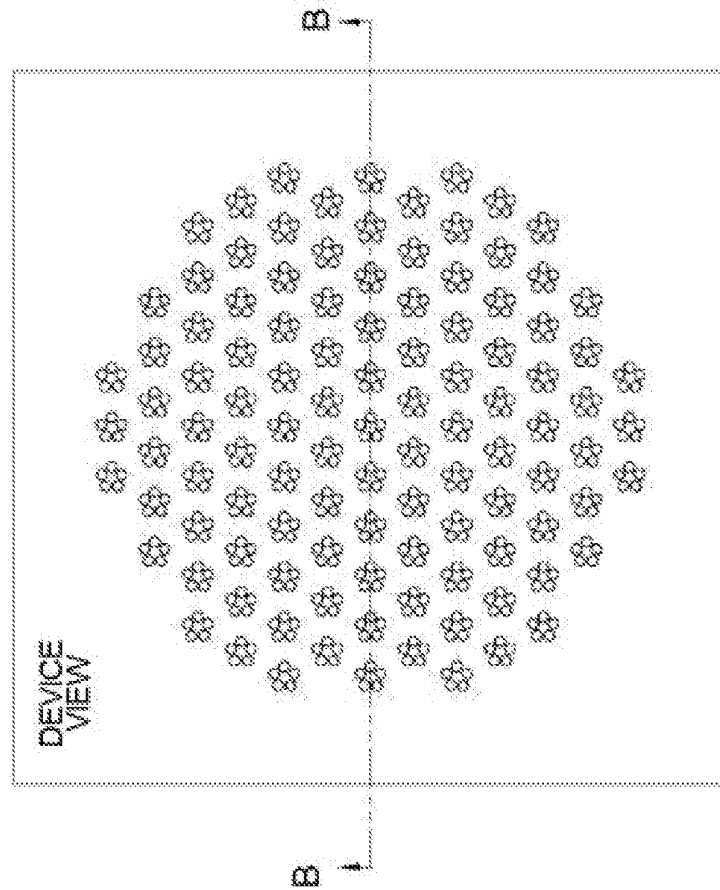


Figure 25B

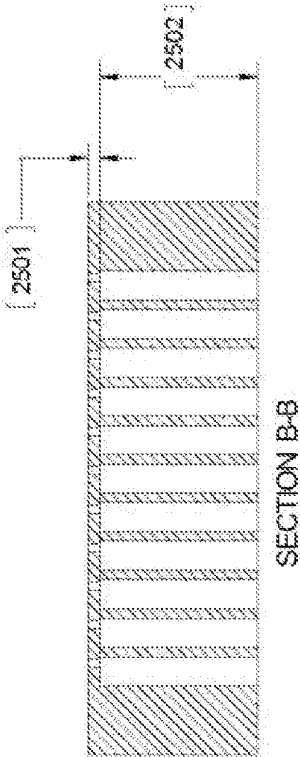


Figure 25C

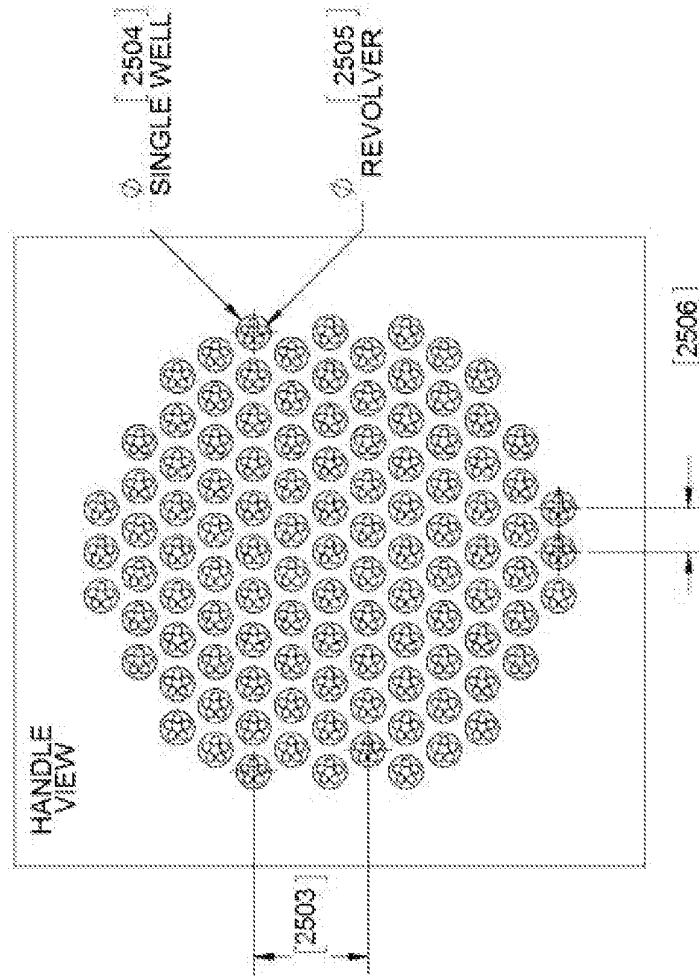


Figure 25D

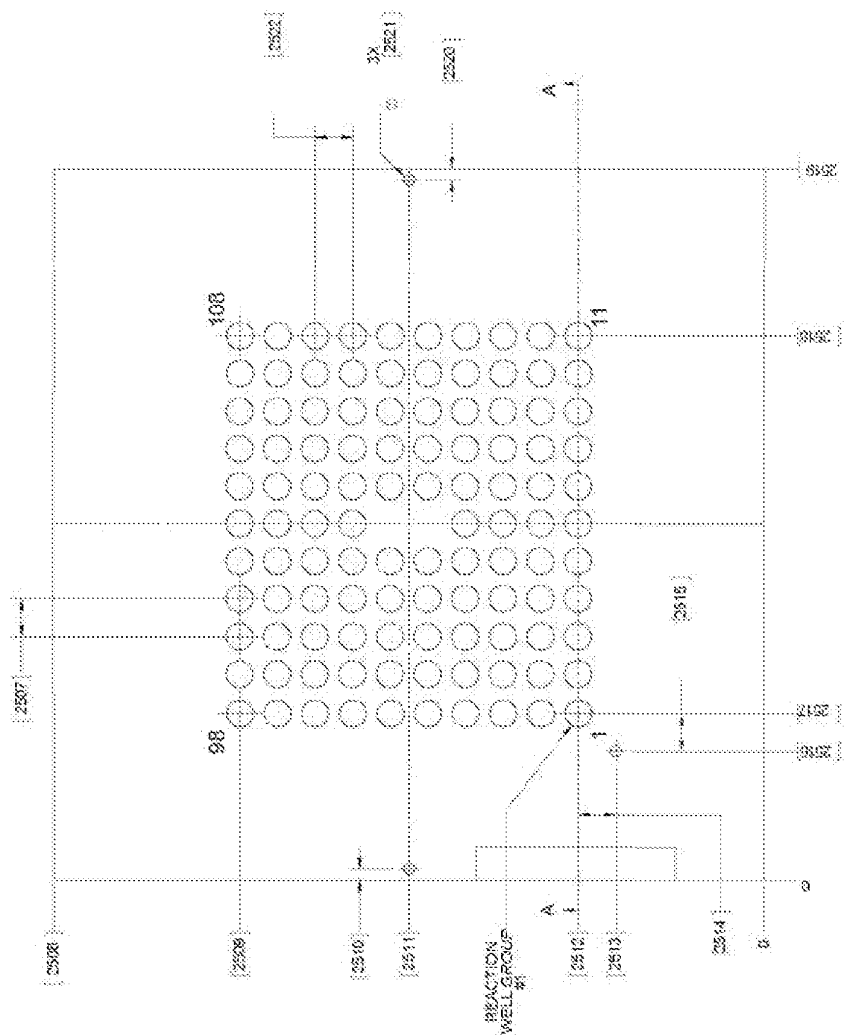


Figure 25E

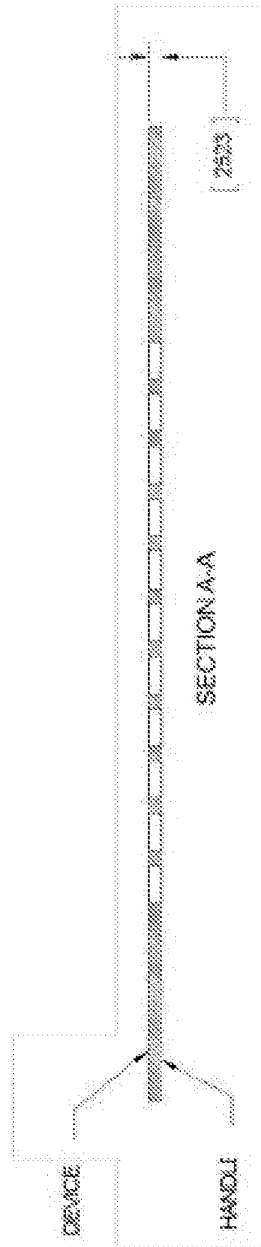


Figure 25F

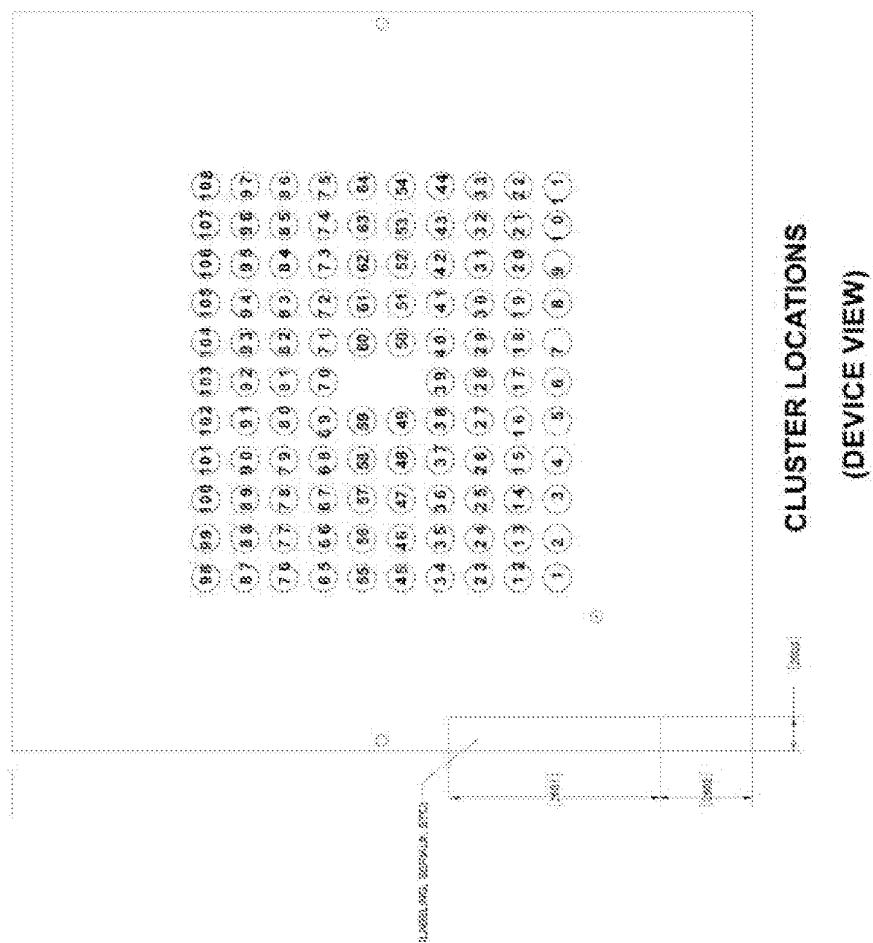


Figure 25G

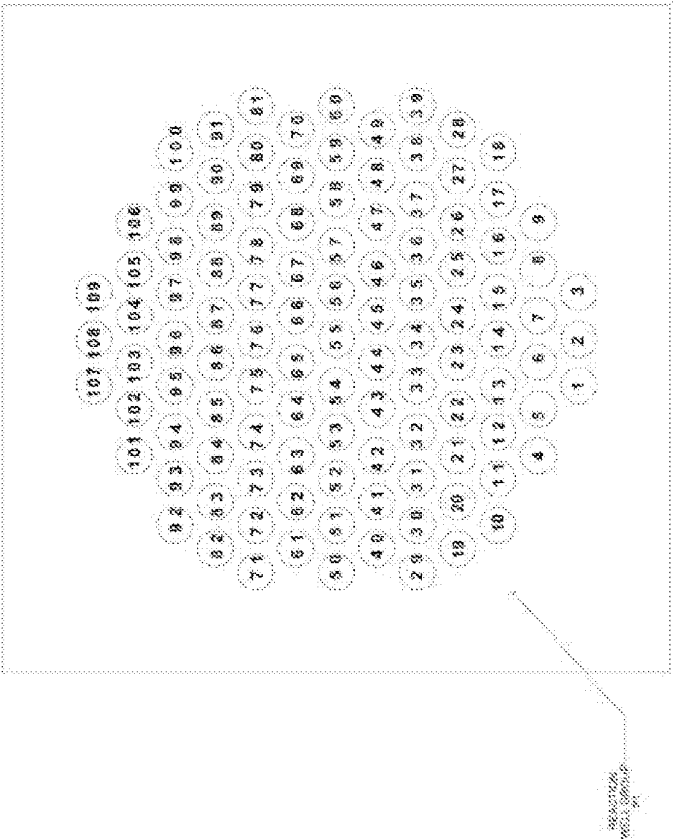


Figure 26A

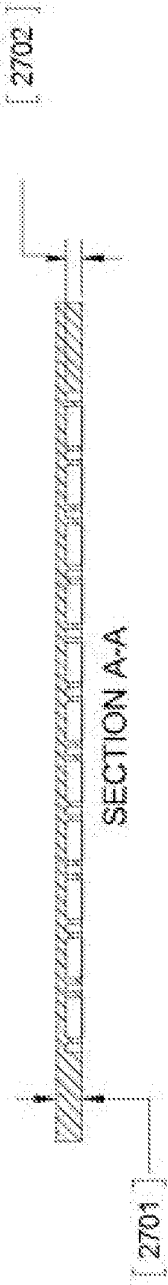


Figure 26B

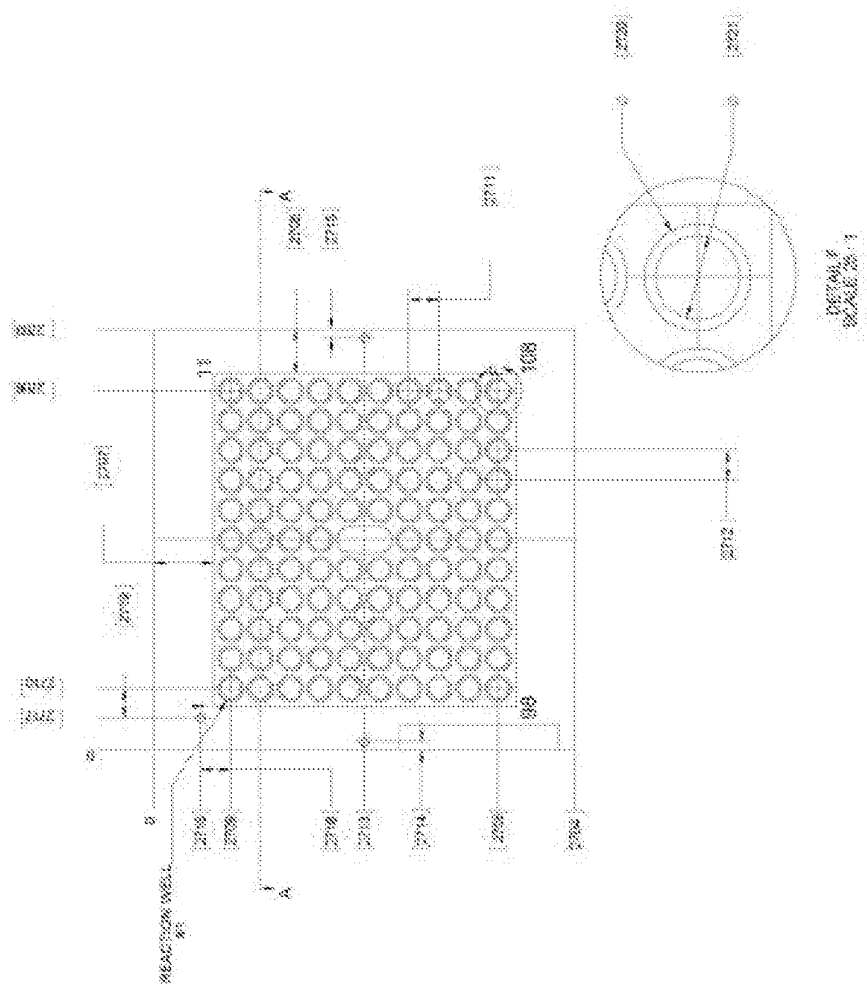


Figure 26C

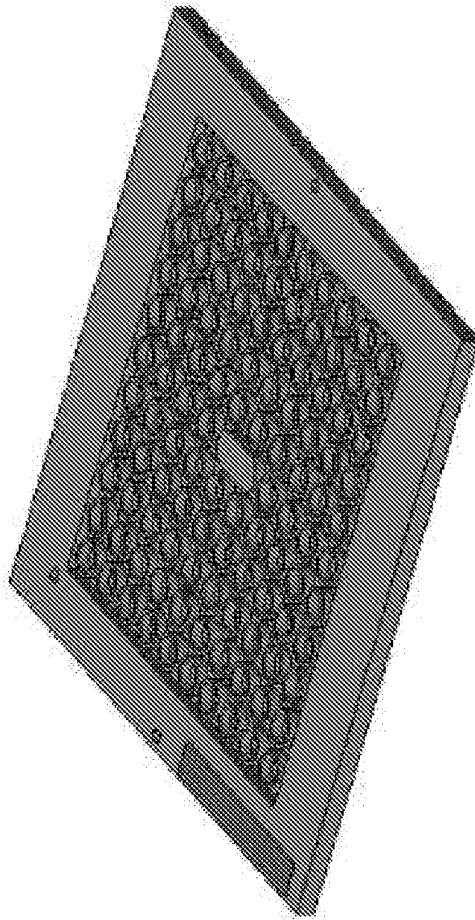


Figure 26D

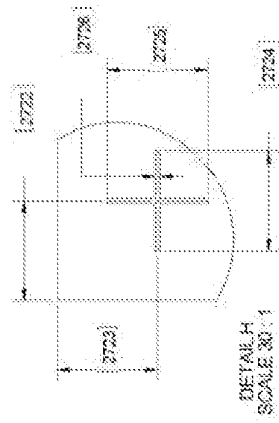
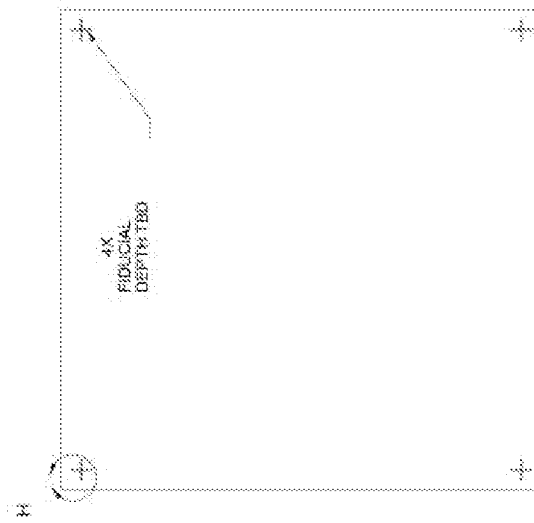


Figure 26E

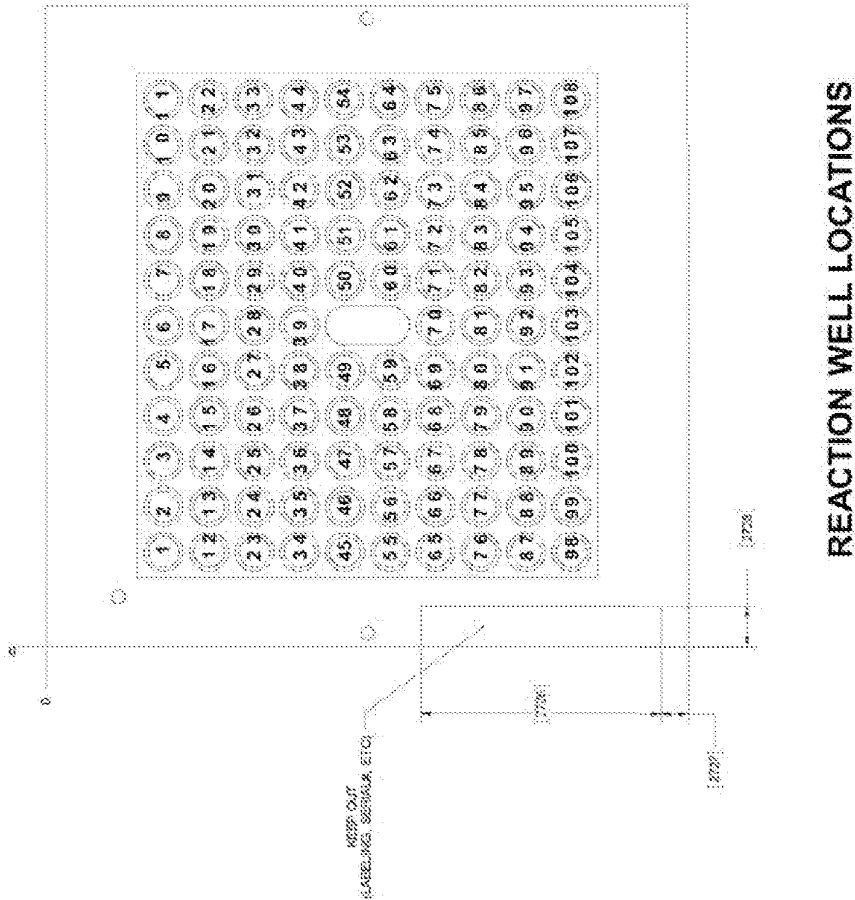


Figure 27

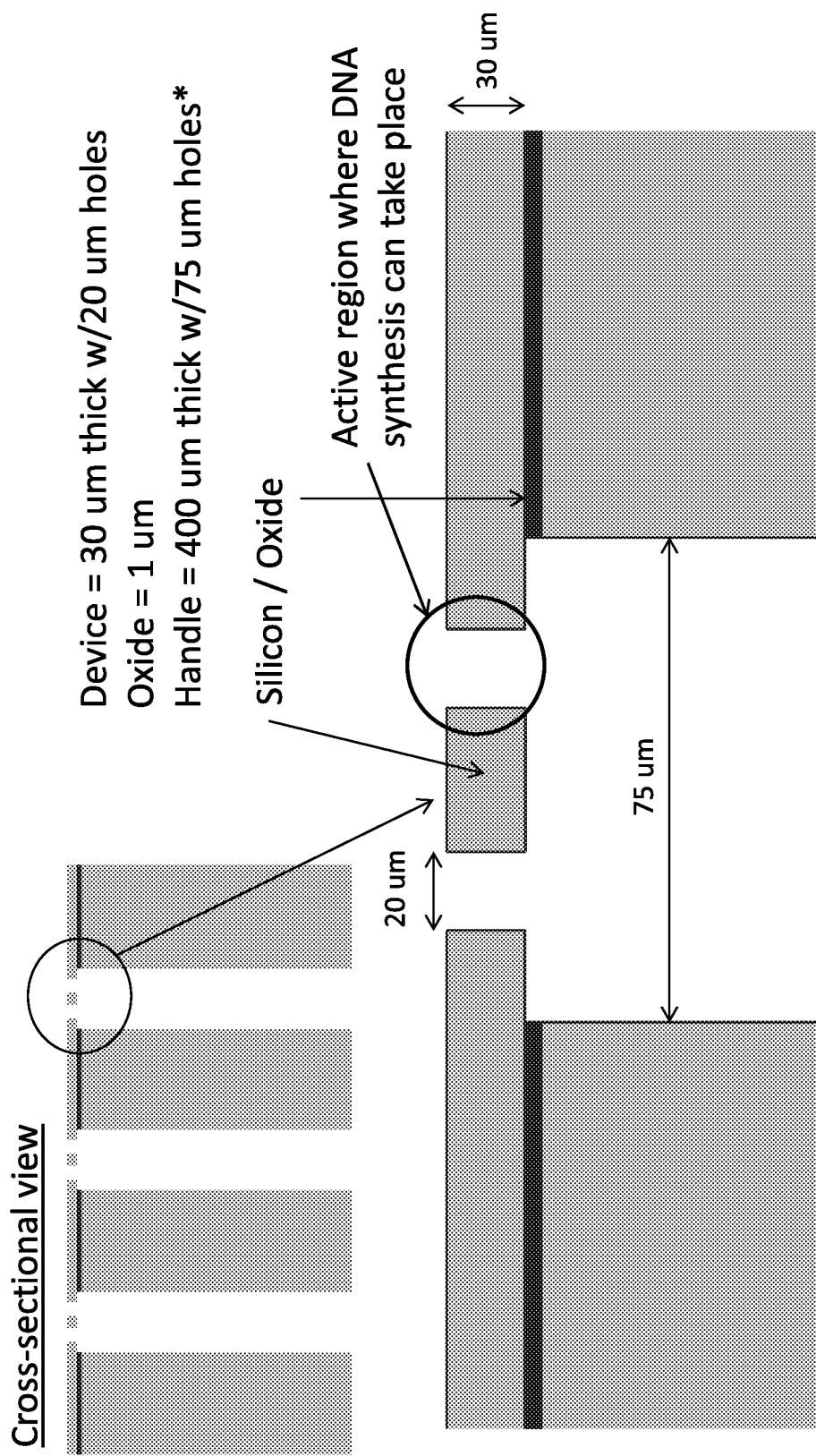


Figure 28

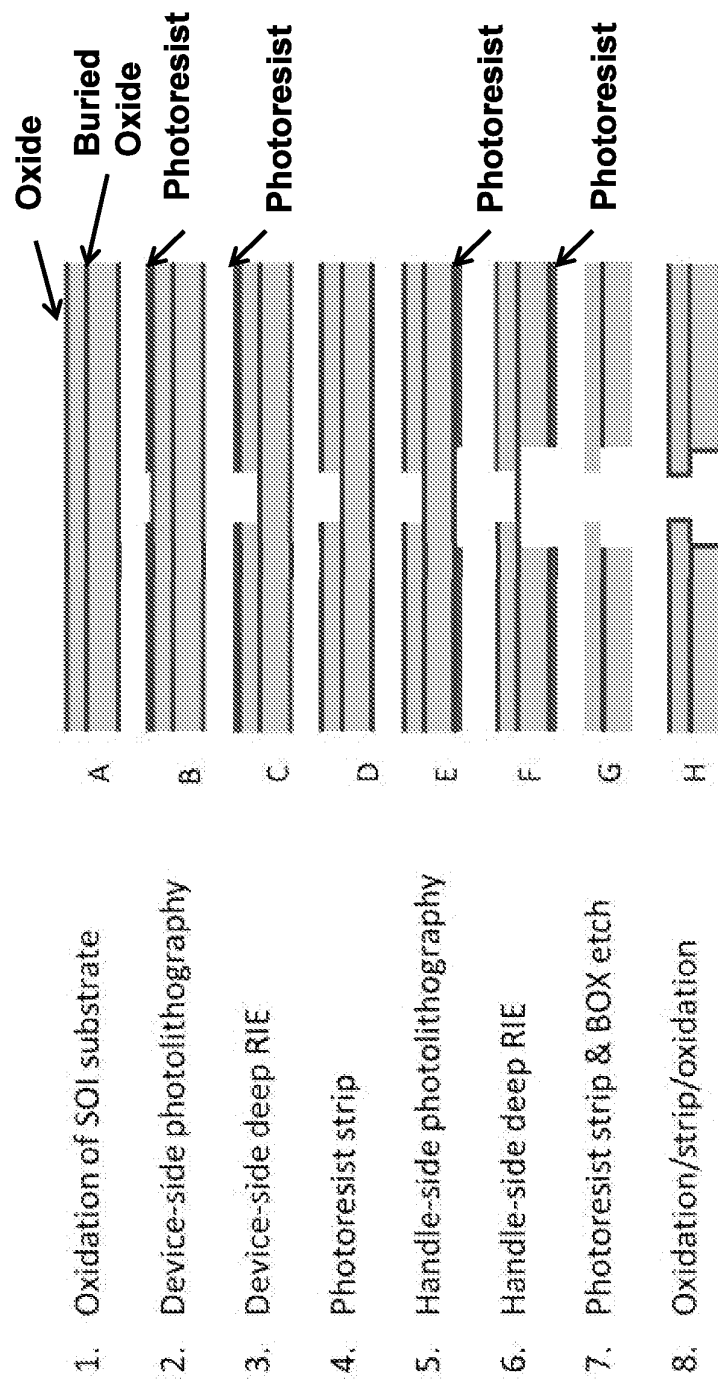


Figure 29

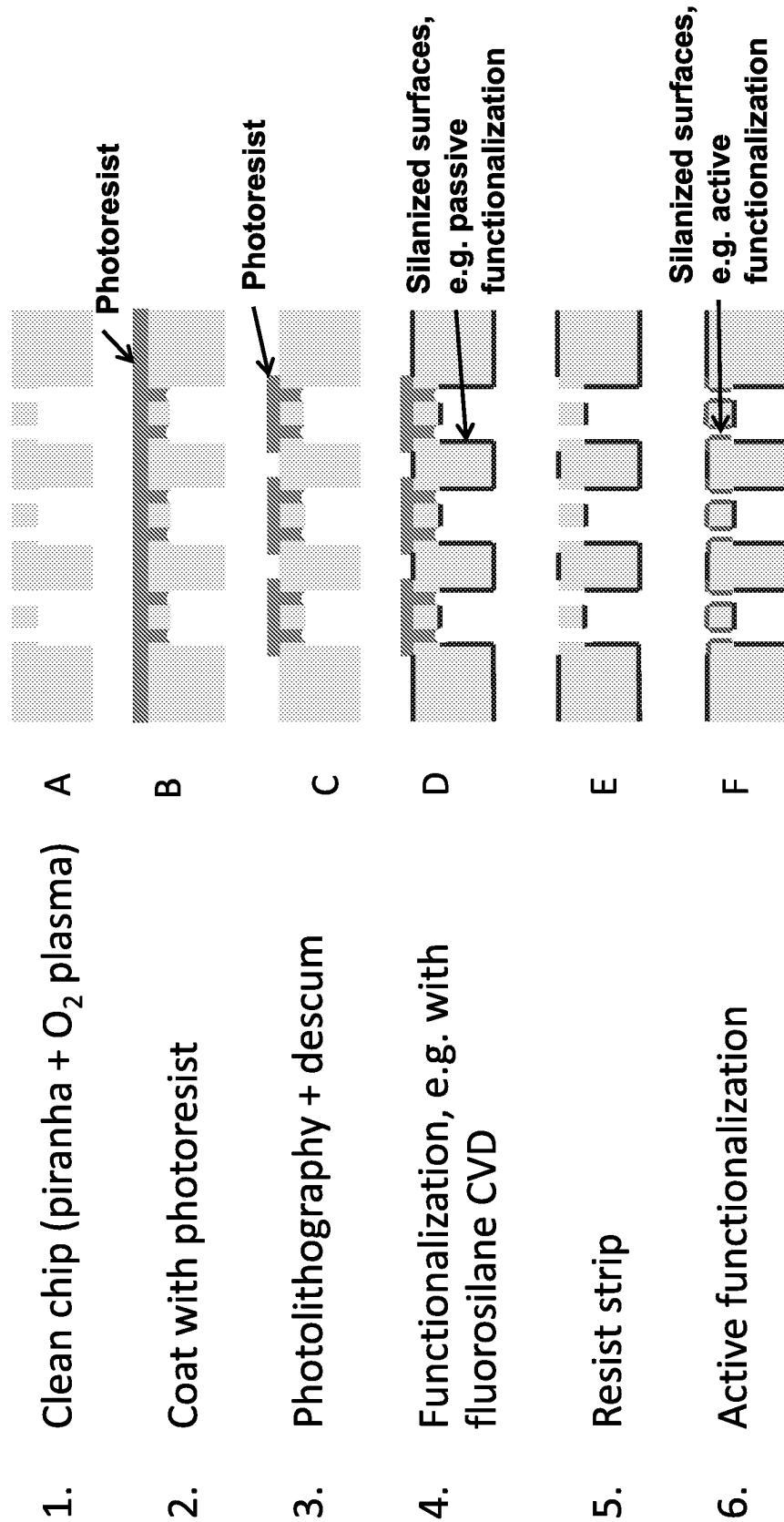


Figure 30

Active Functionalization

- Dilute concentration of hydroxyl groups in a sea of passive groups by applying mixed silanes

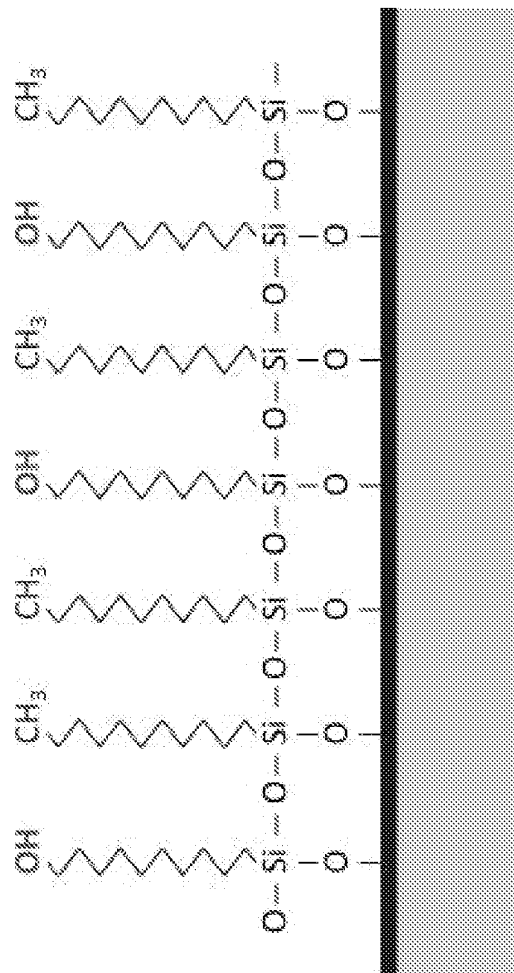


Figure 31

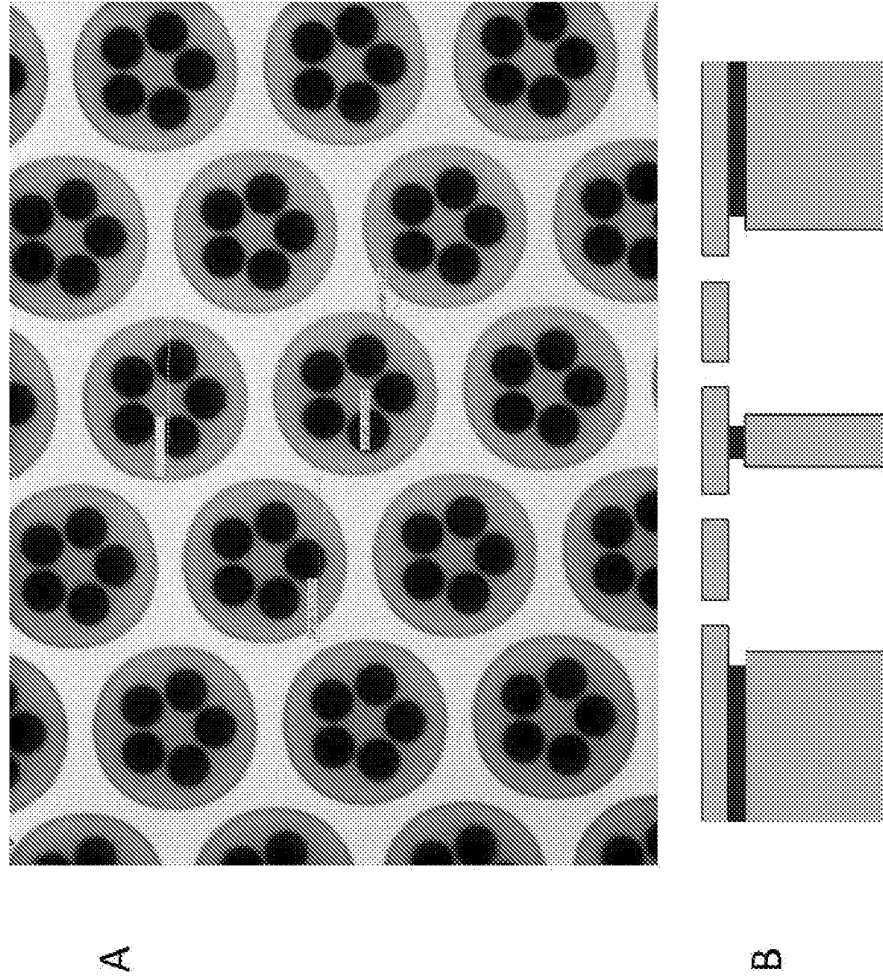


Figure 32

Nanowell Chip Structure

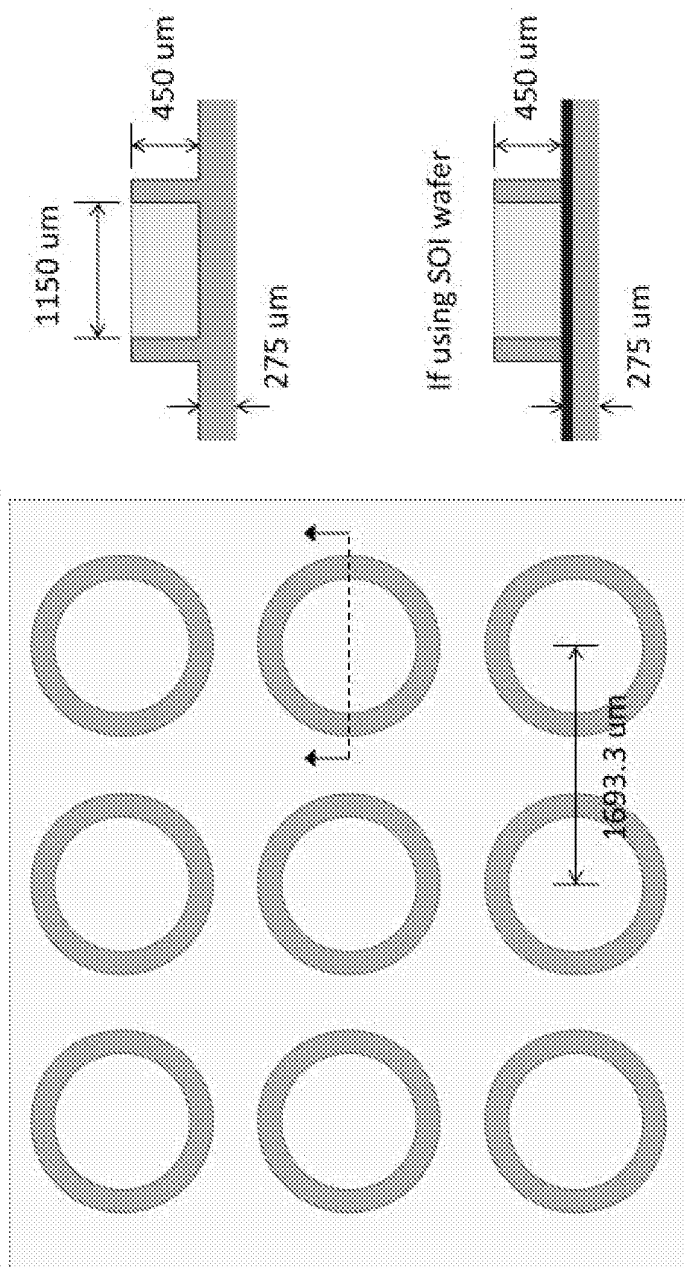


Figure 33

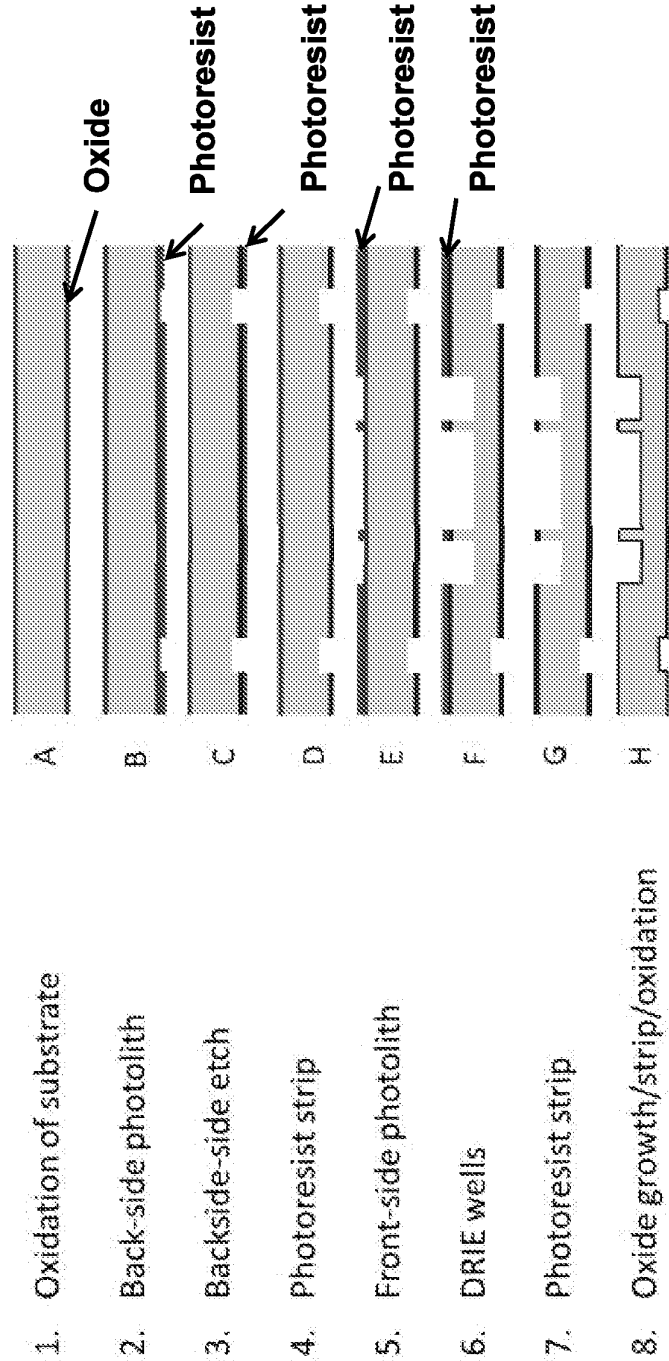


Figure 34

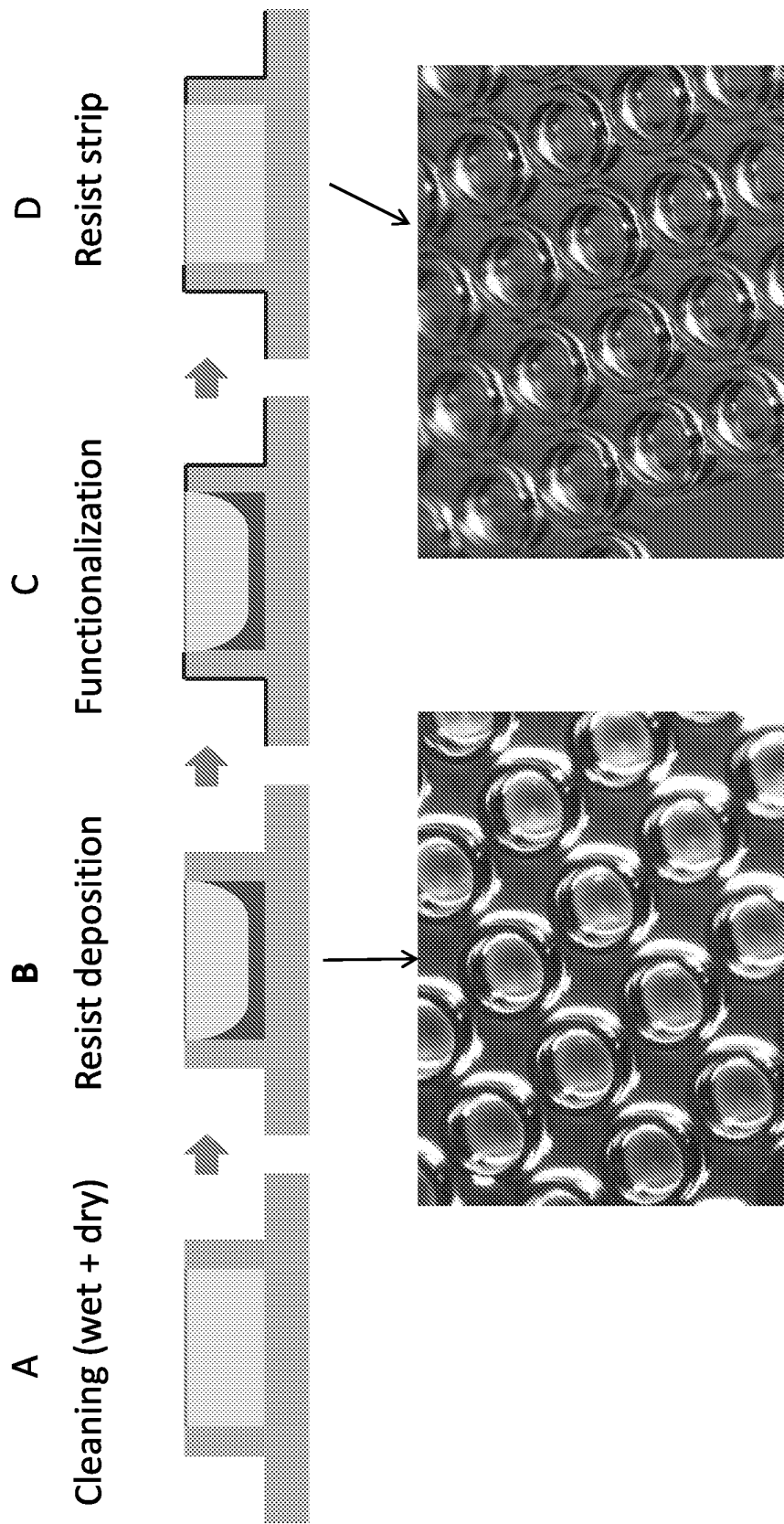


Figure 35

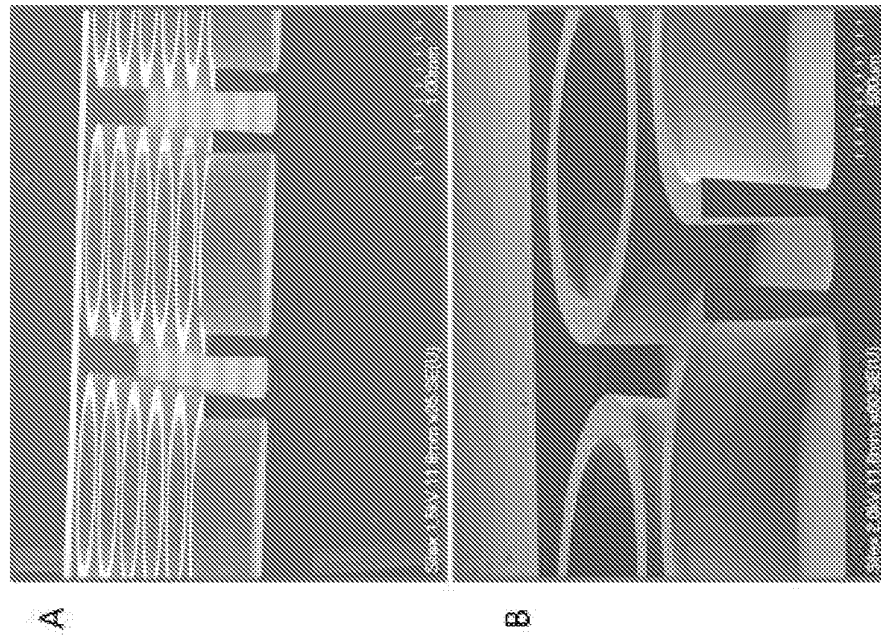


Figure 36

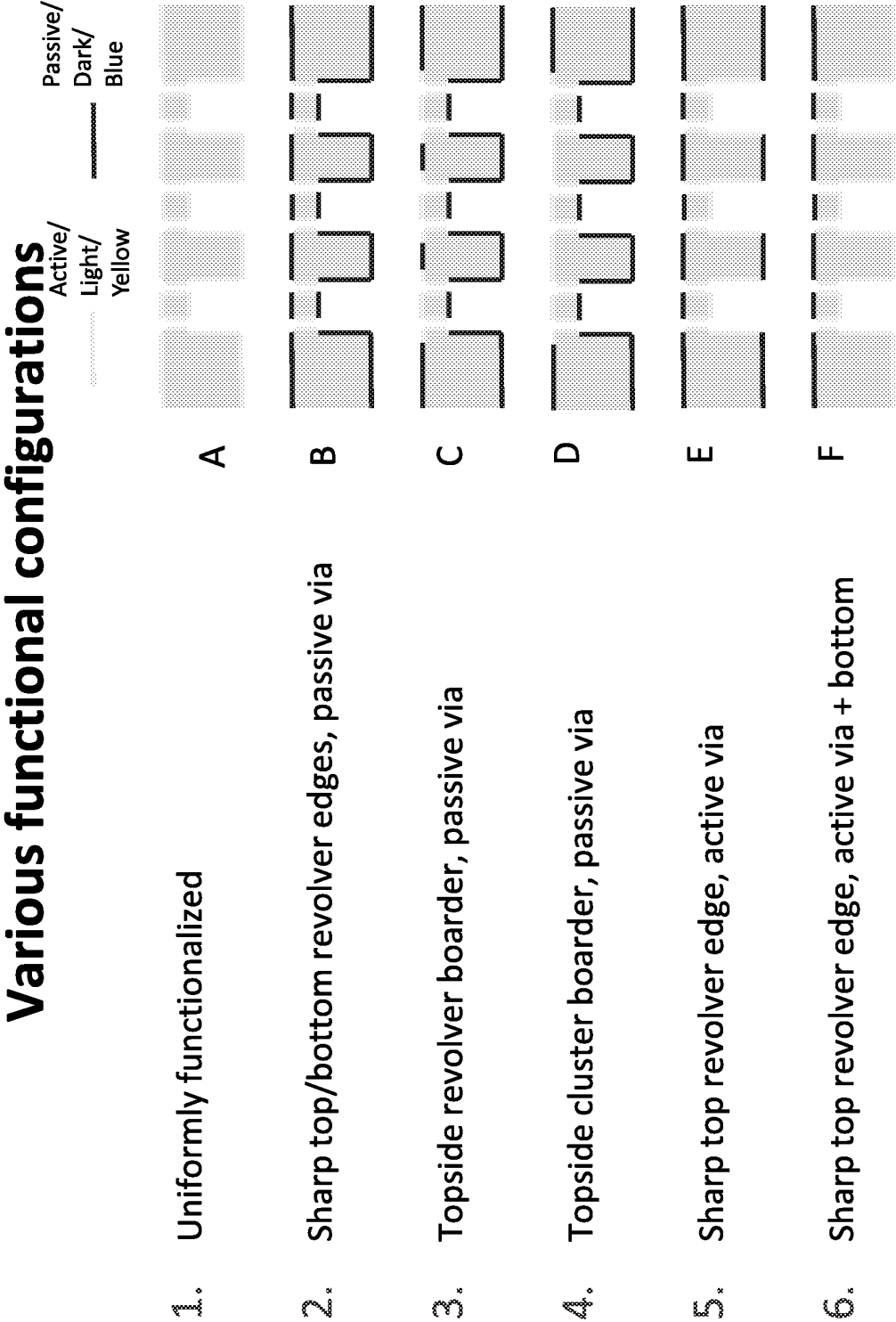


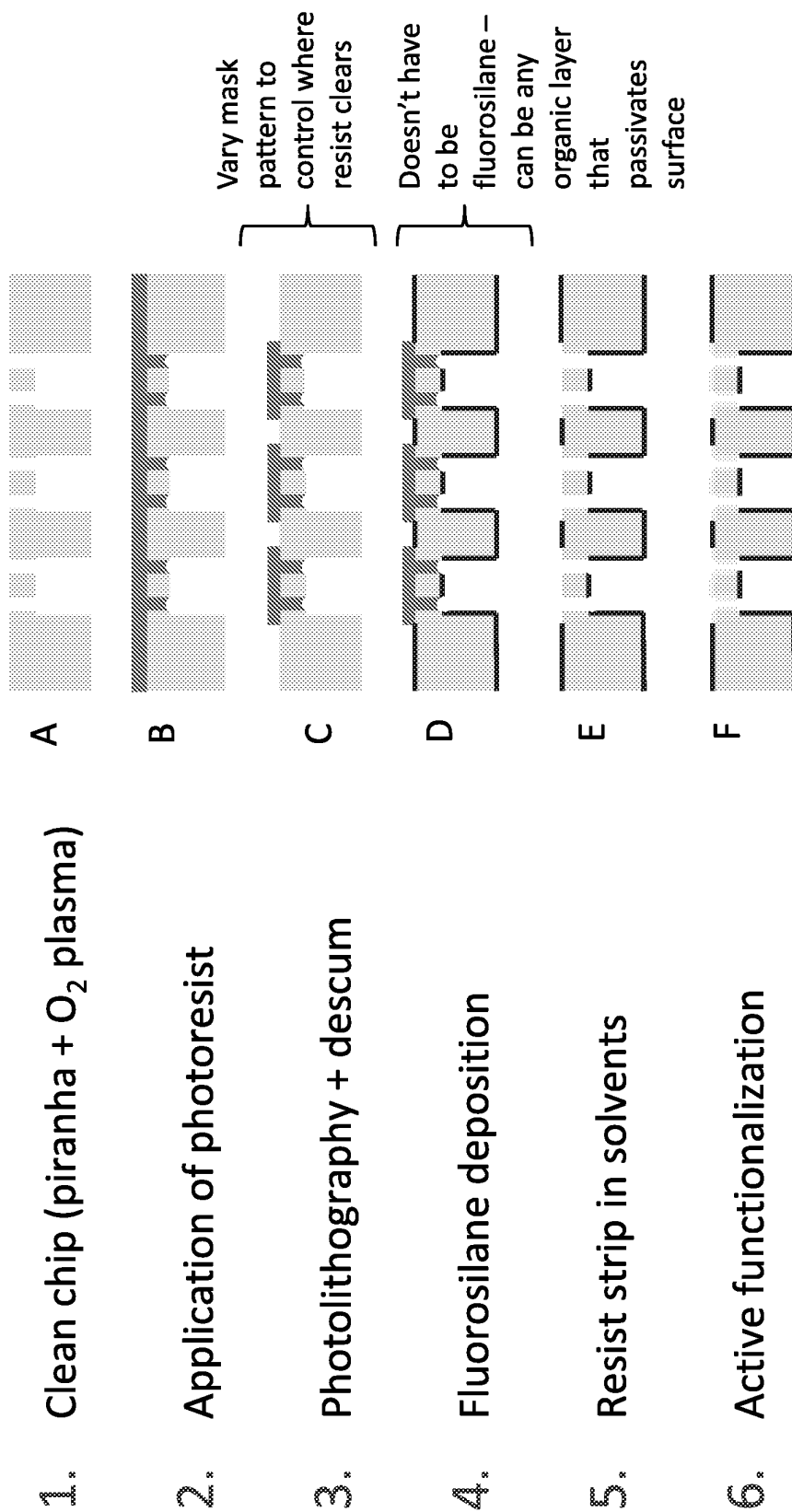
Figure 37**Process Flow A (for config 2 – 4)**

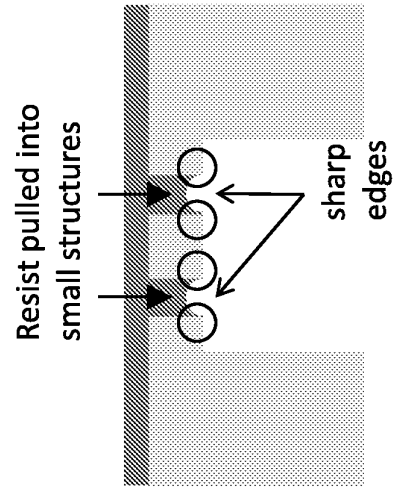
Figure 38**Resist wicking control process**

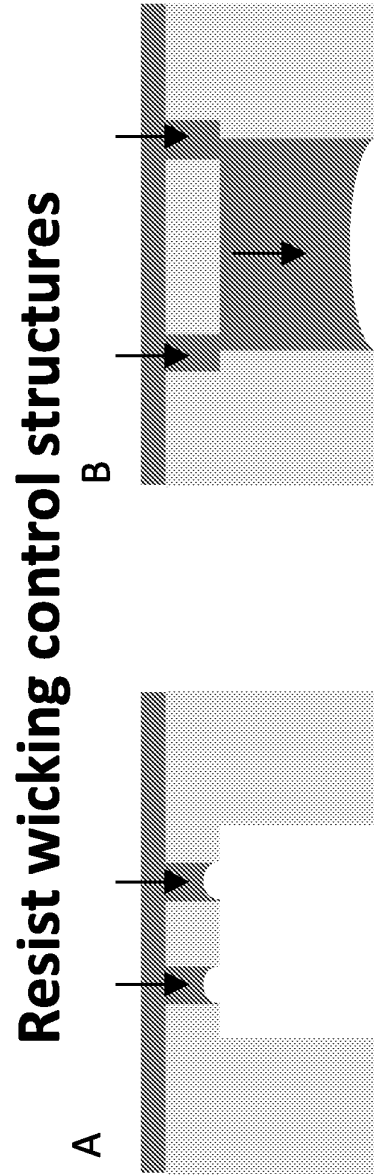
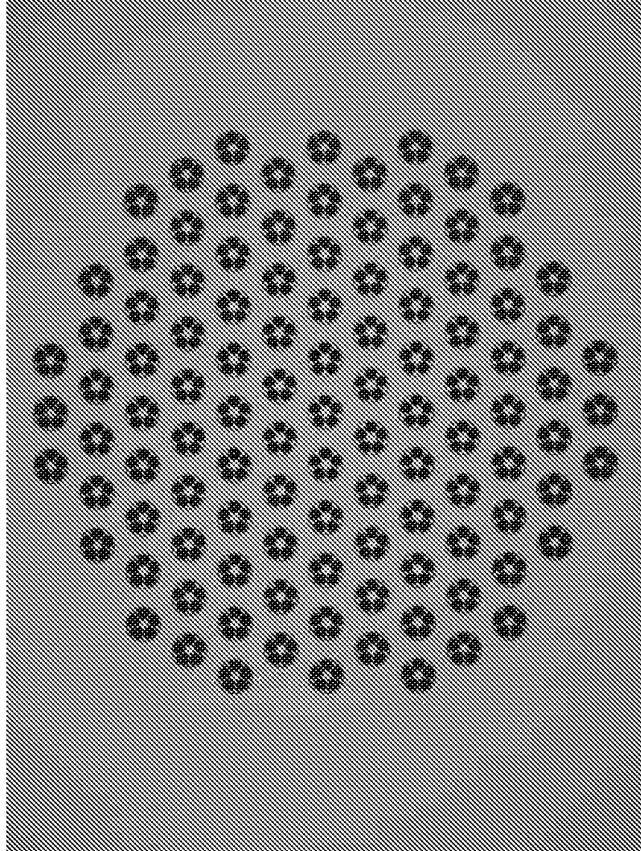
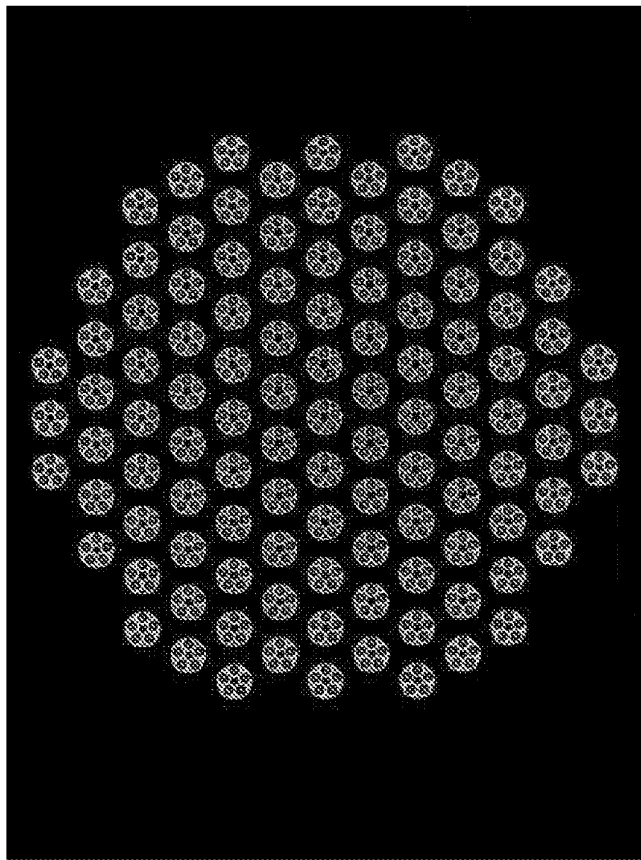
Figure 39

Figure 40
Post-litho resist patterns

A



B

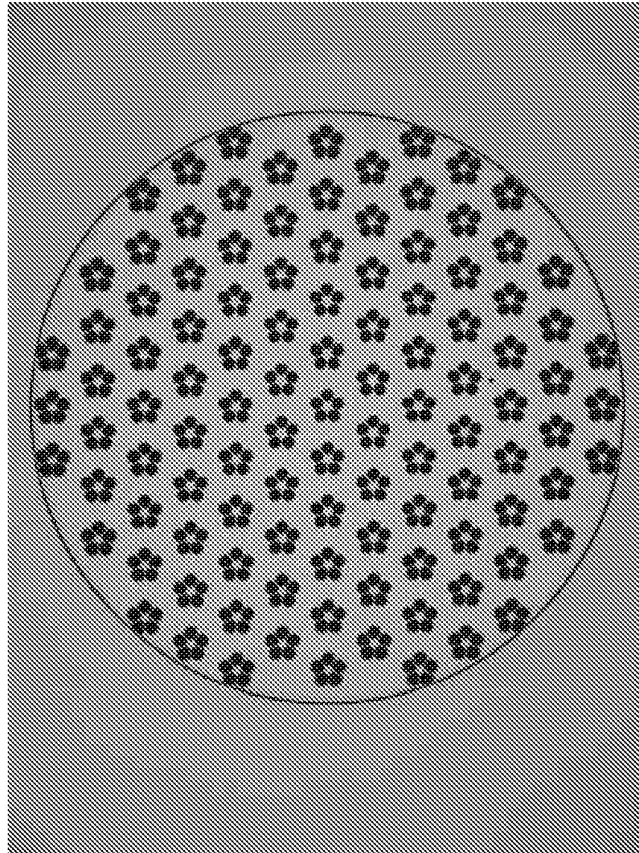


C

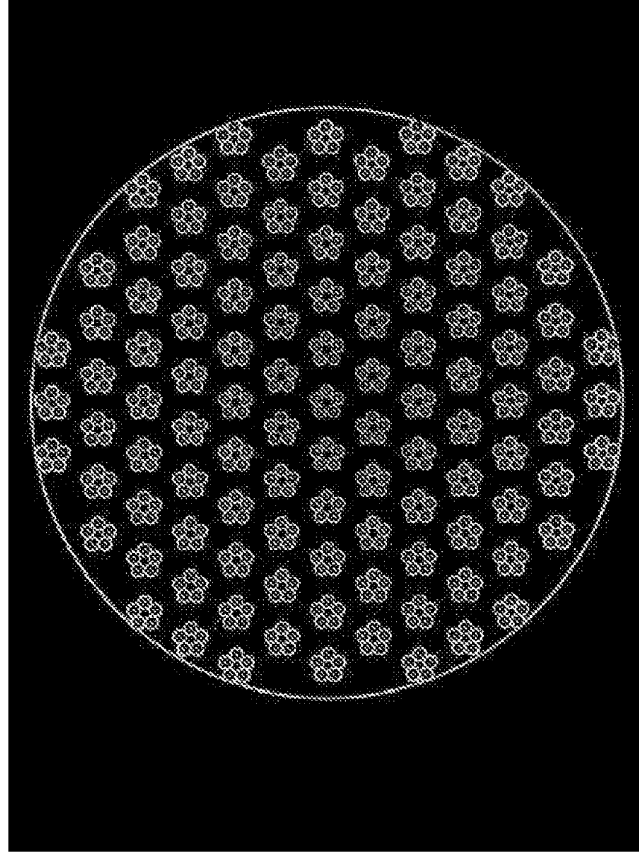


Figure 41
Post-litho resist patterns

A



B



C



Figure 42
Post resist strip (after fluorination)

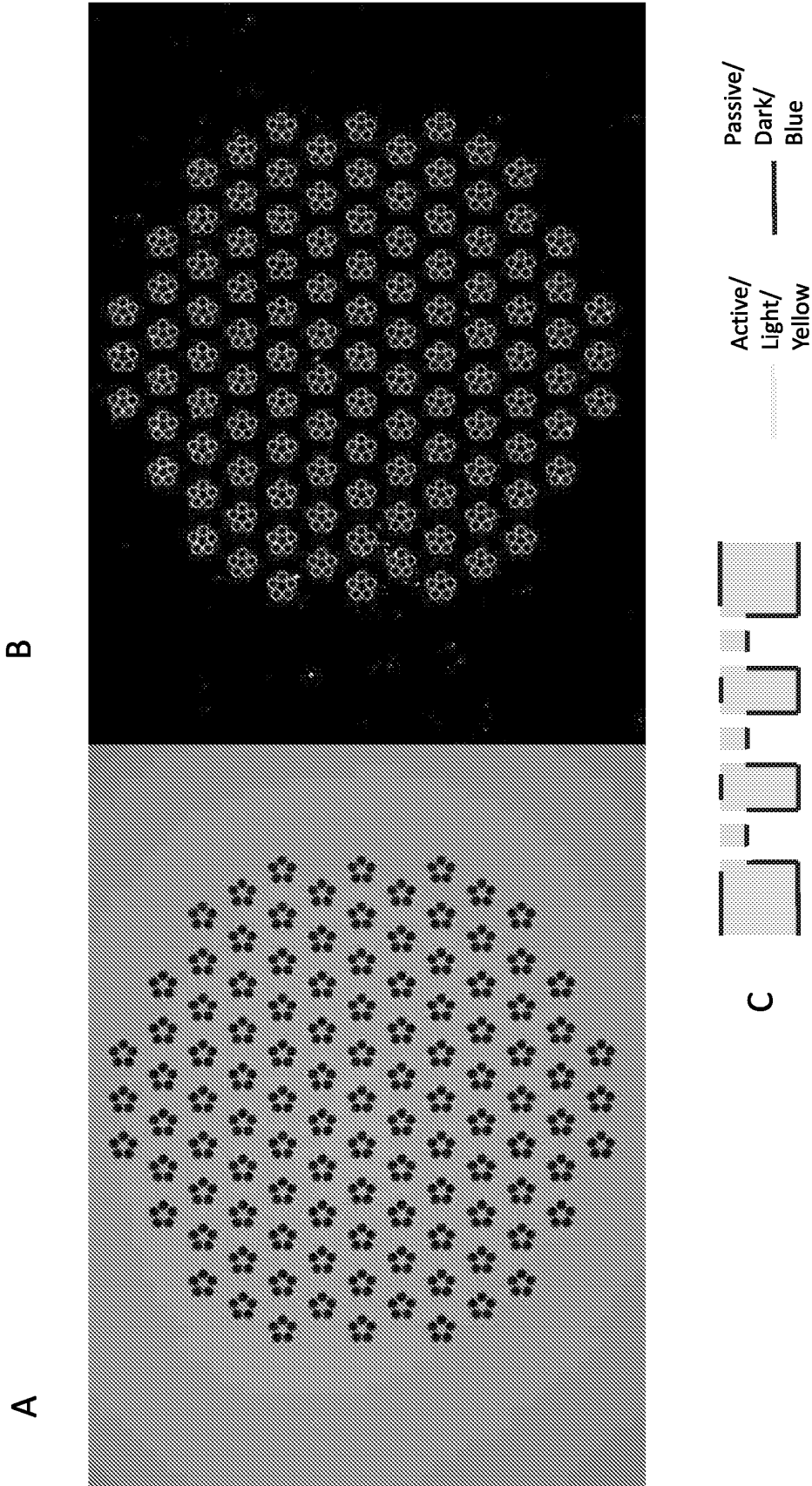
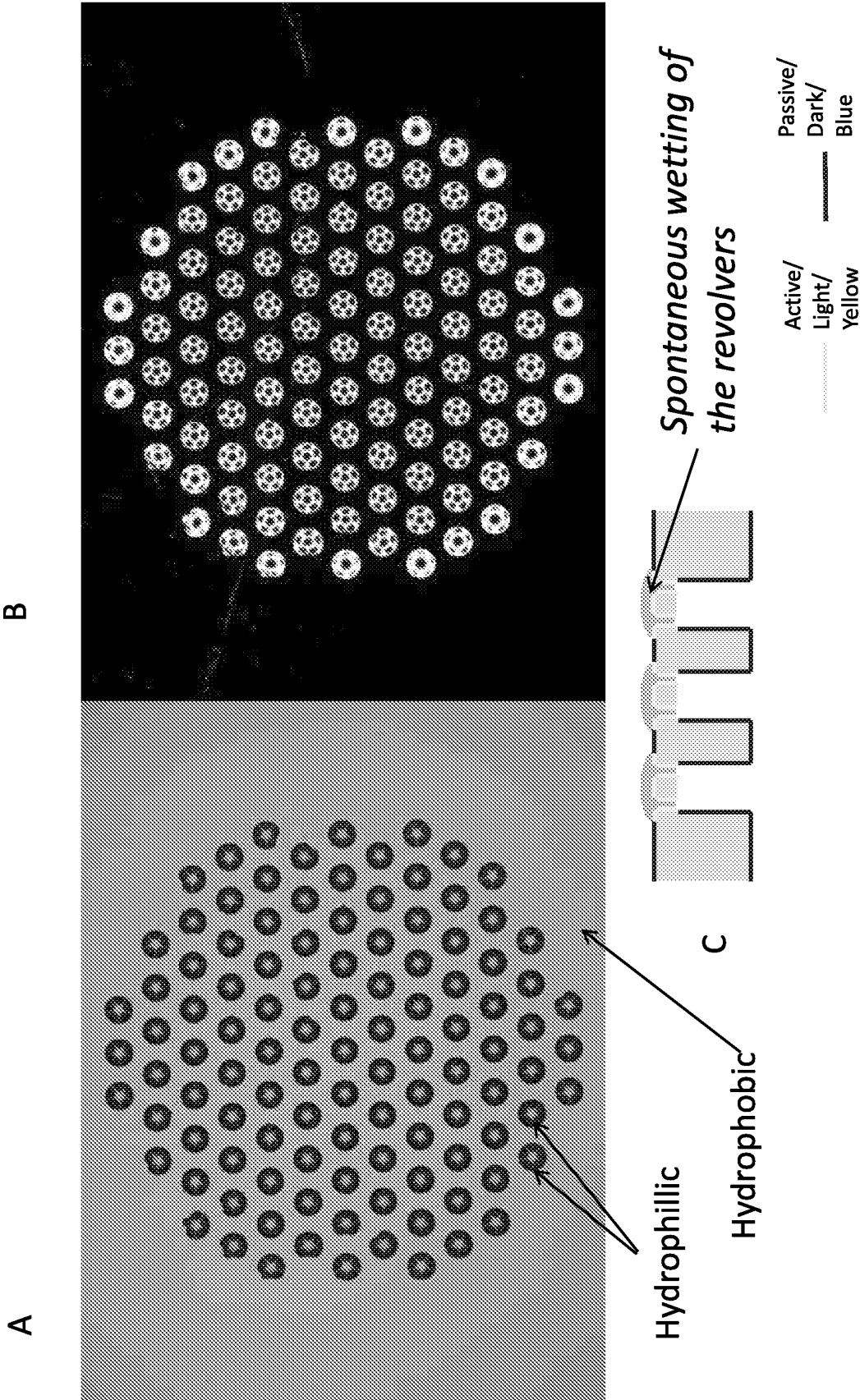


Figure 43
Keratin chip fully loaded with DMSO



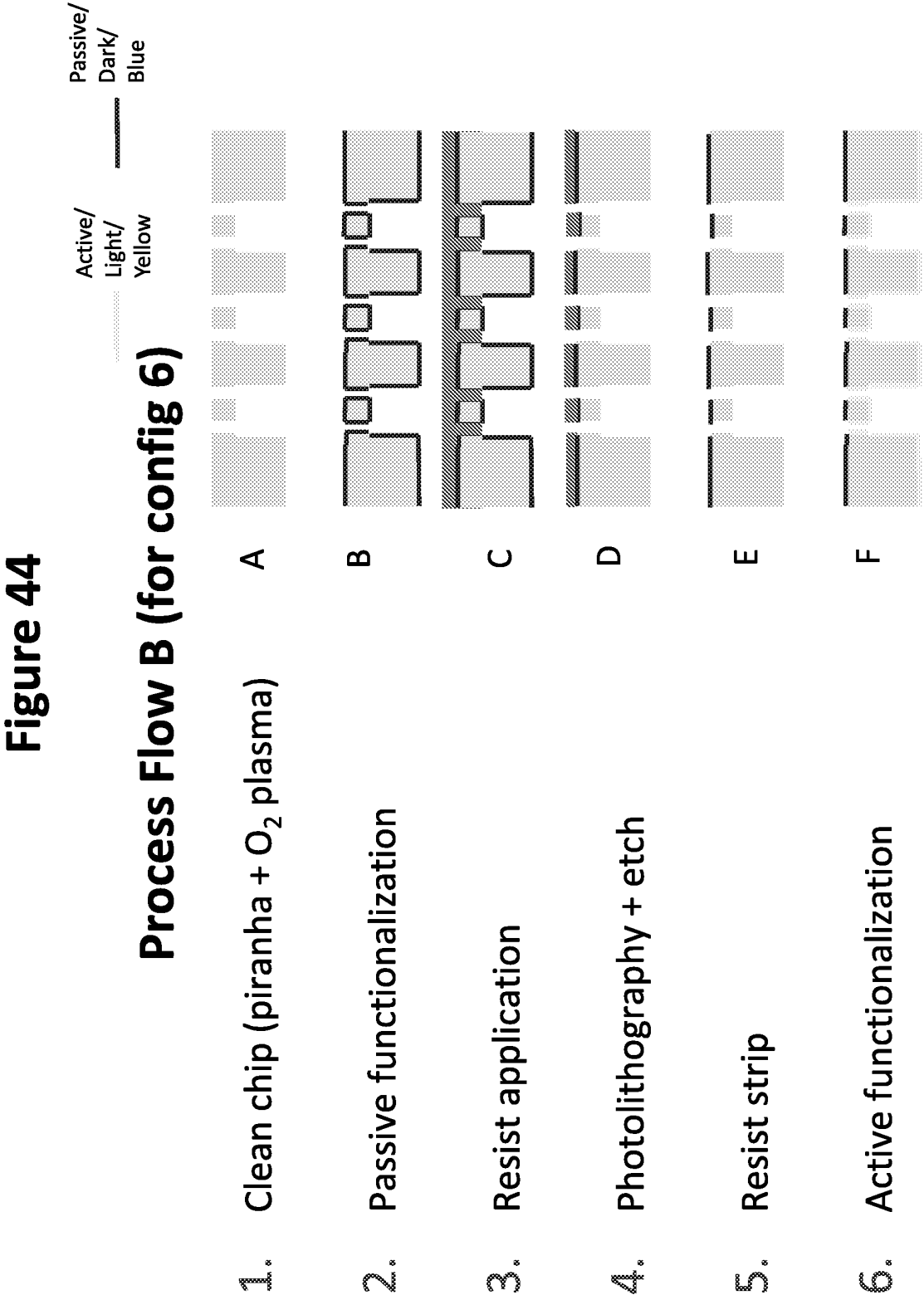


Figure 45

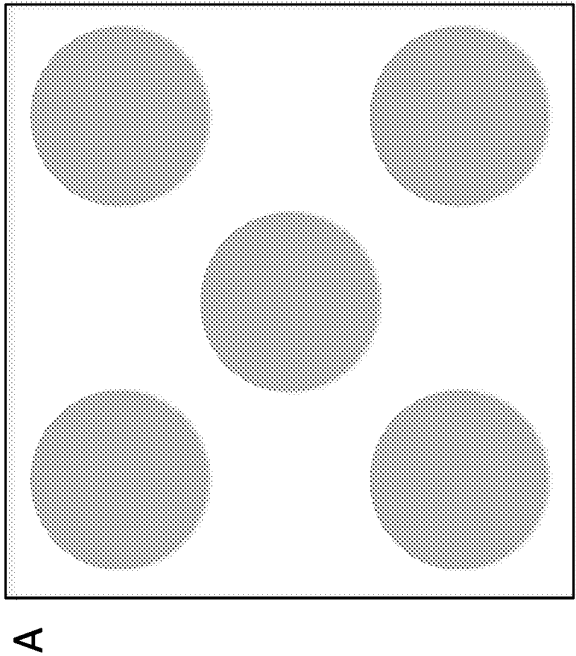
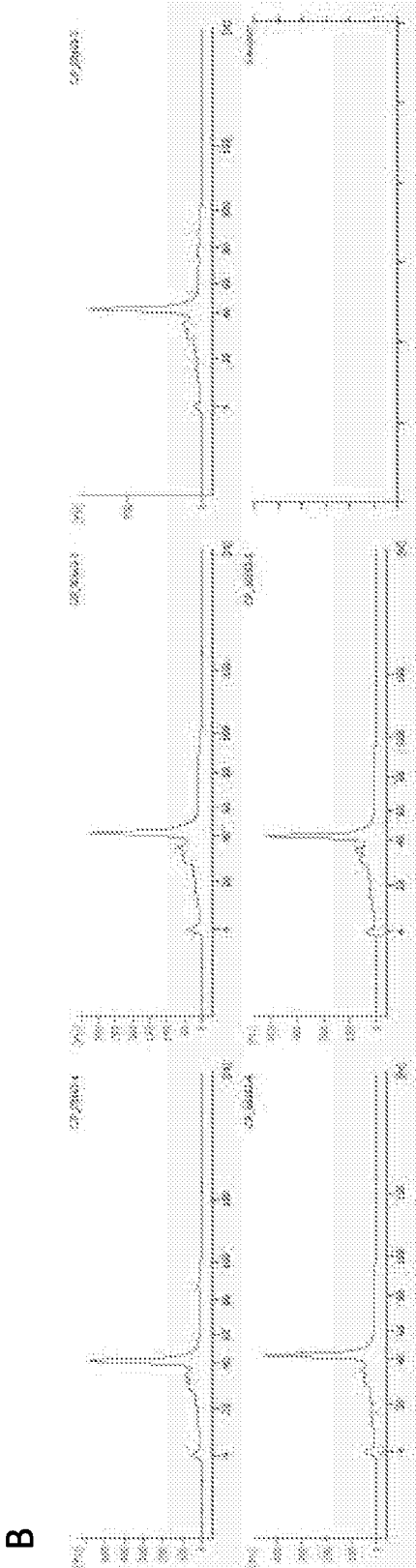


Figure 46

Synthesis of a 100mer sequence on 2D oligonucleotide synthesis device

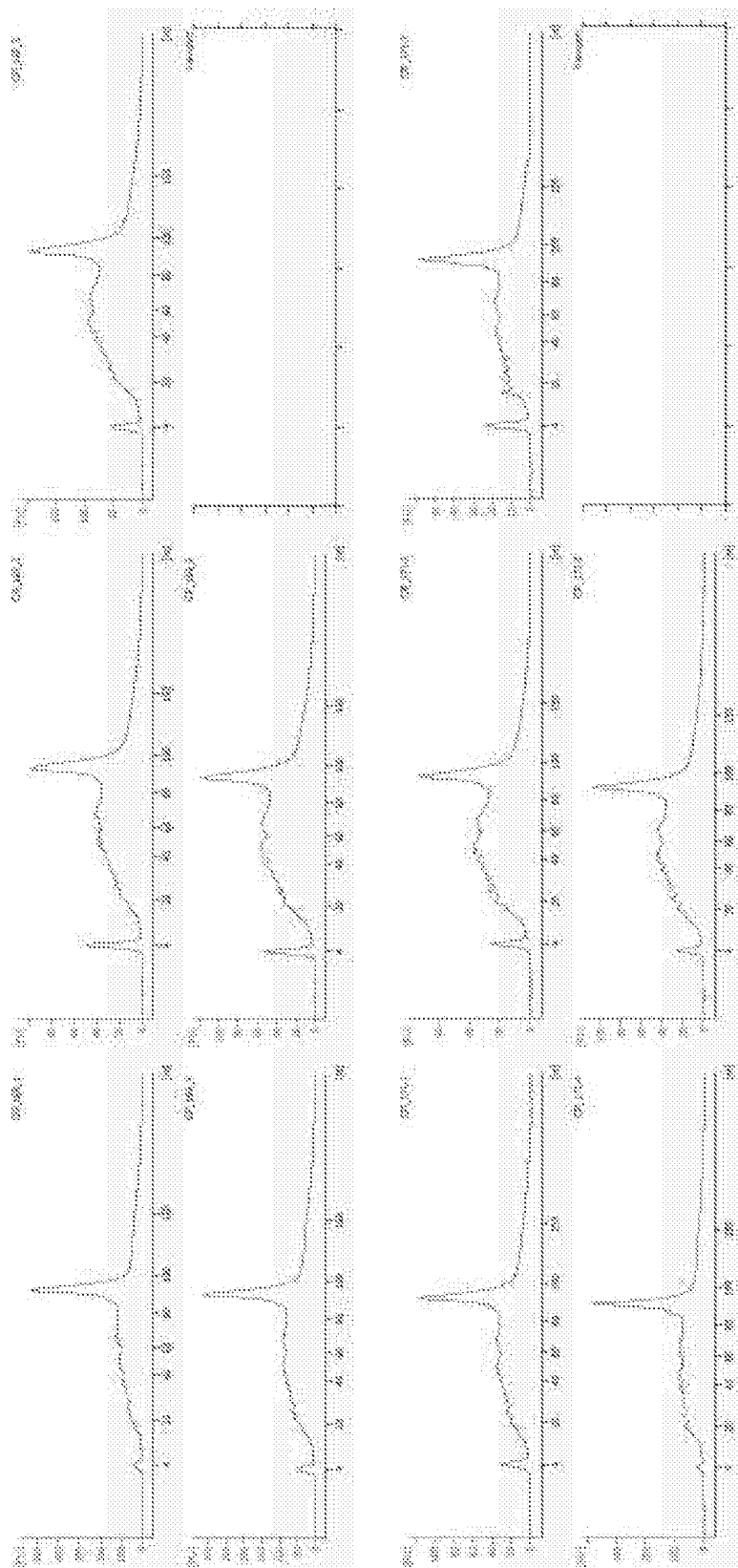


Figure 47

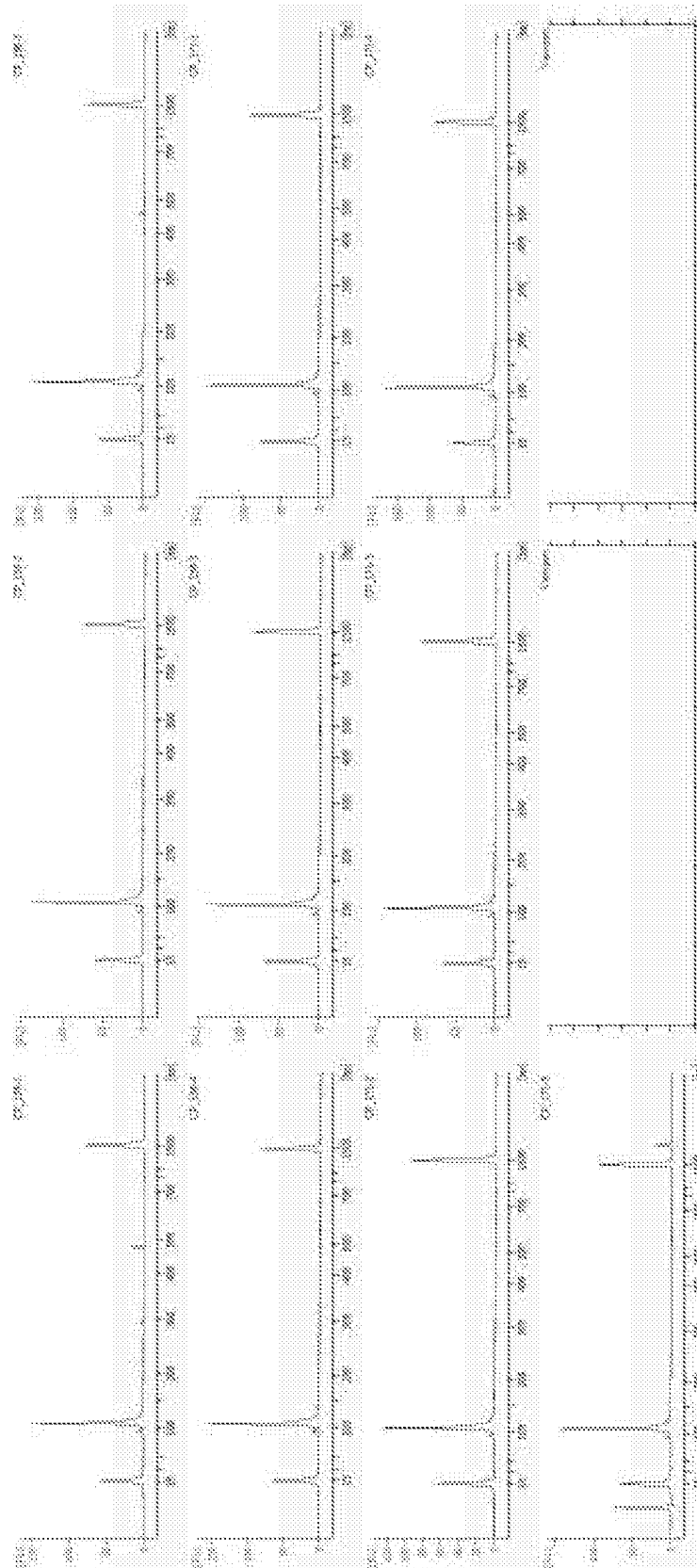


Figure 48

Alignment Map

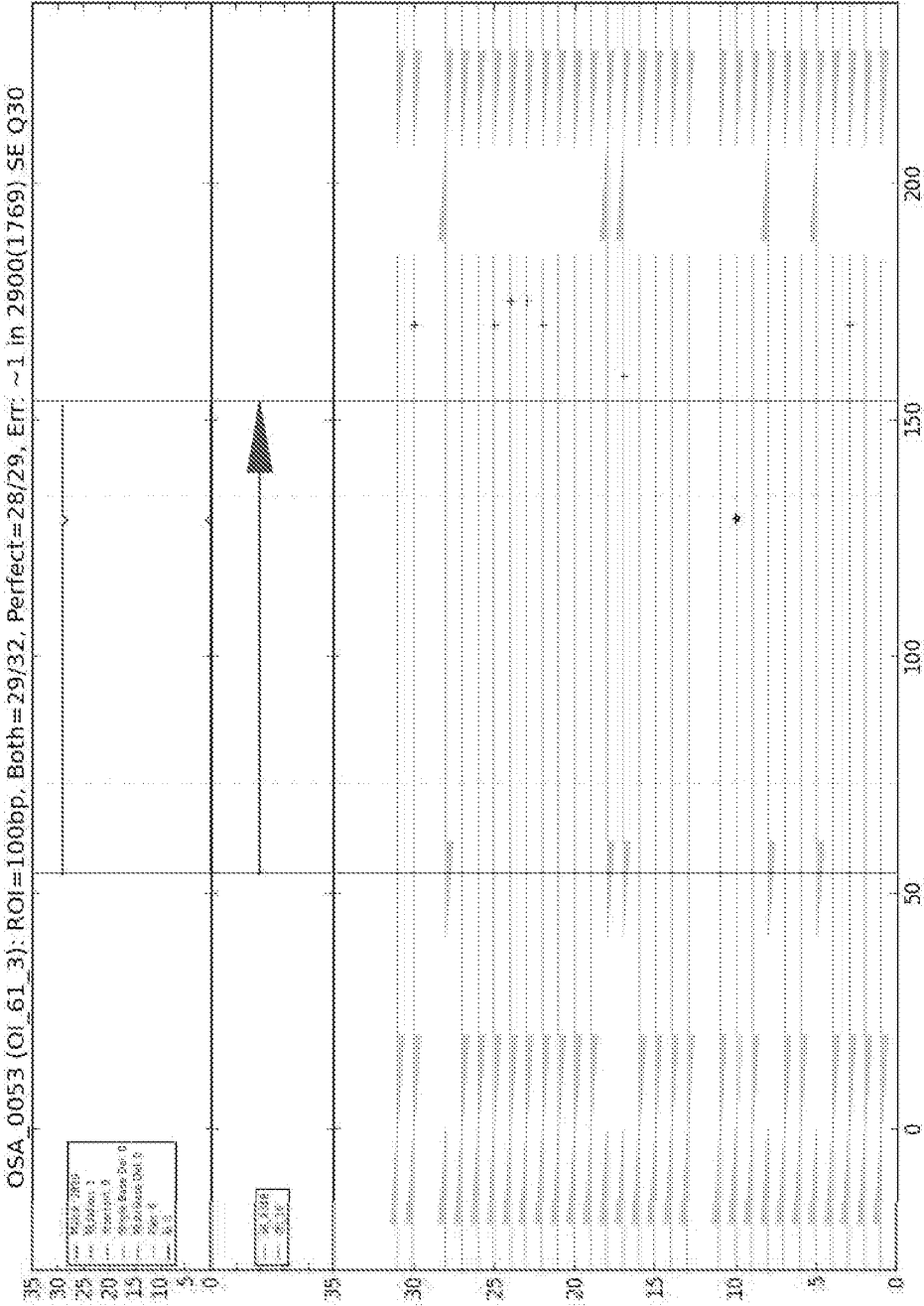
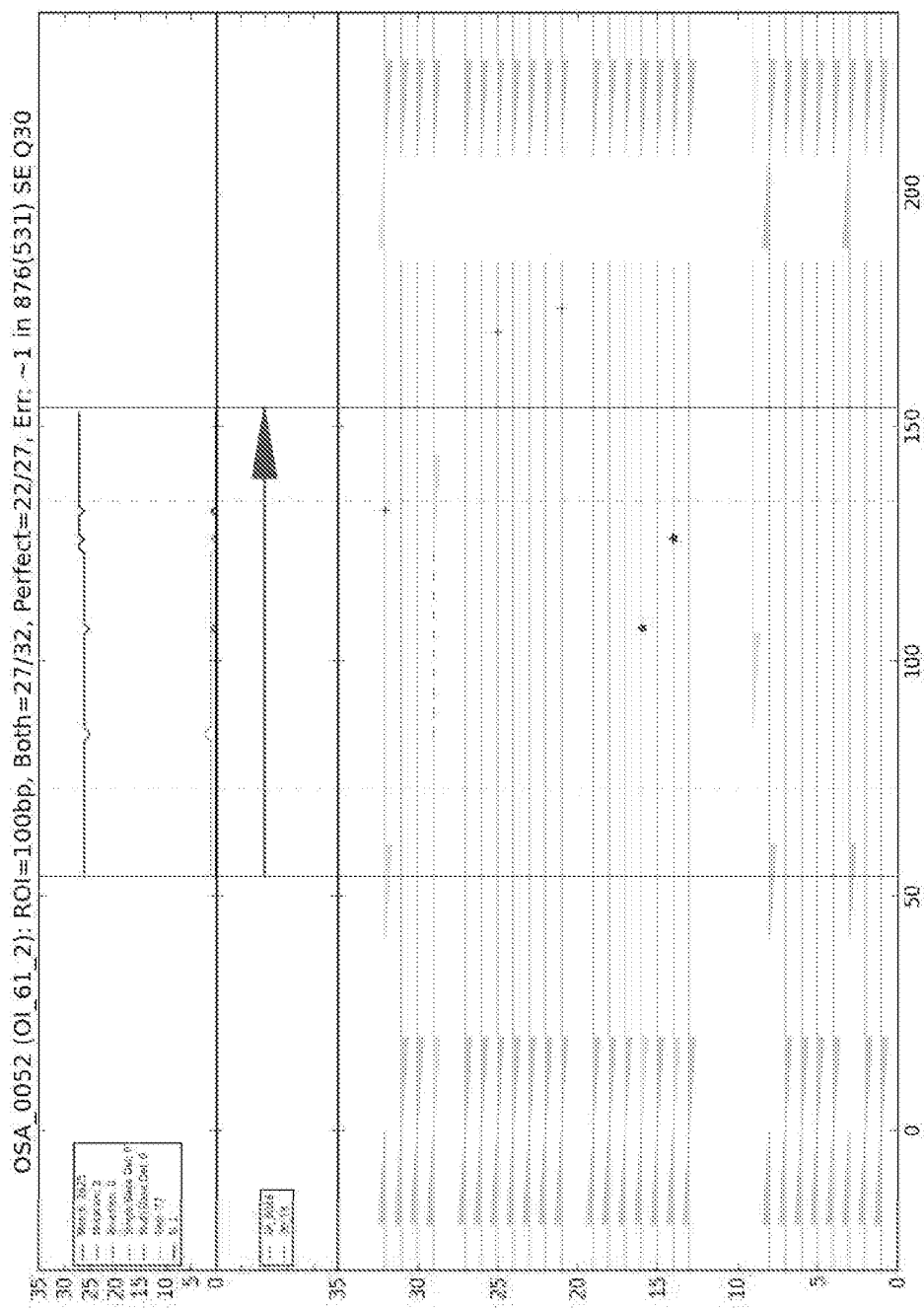


Figure 49

Alignment Map



4/5/2014

Figure 50

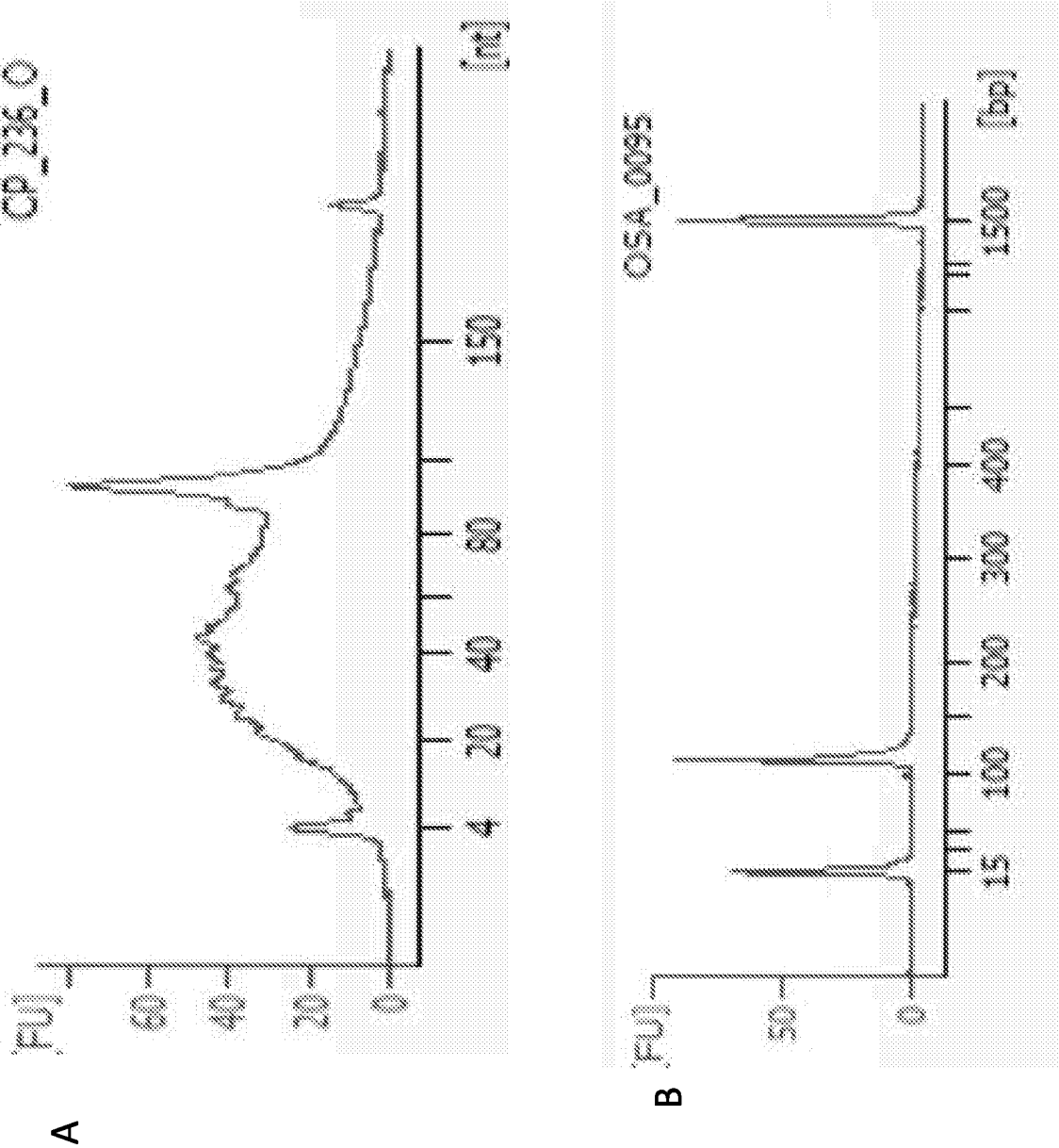


Figure 51

Alignment Map

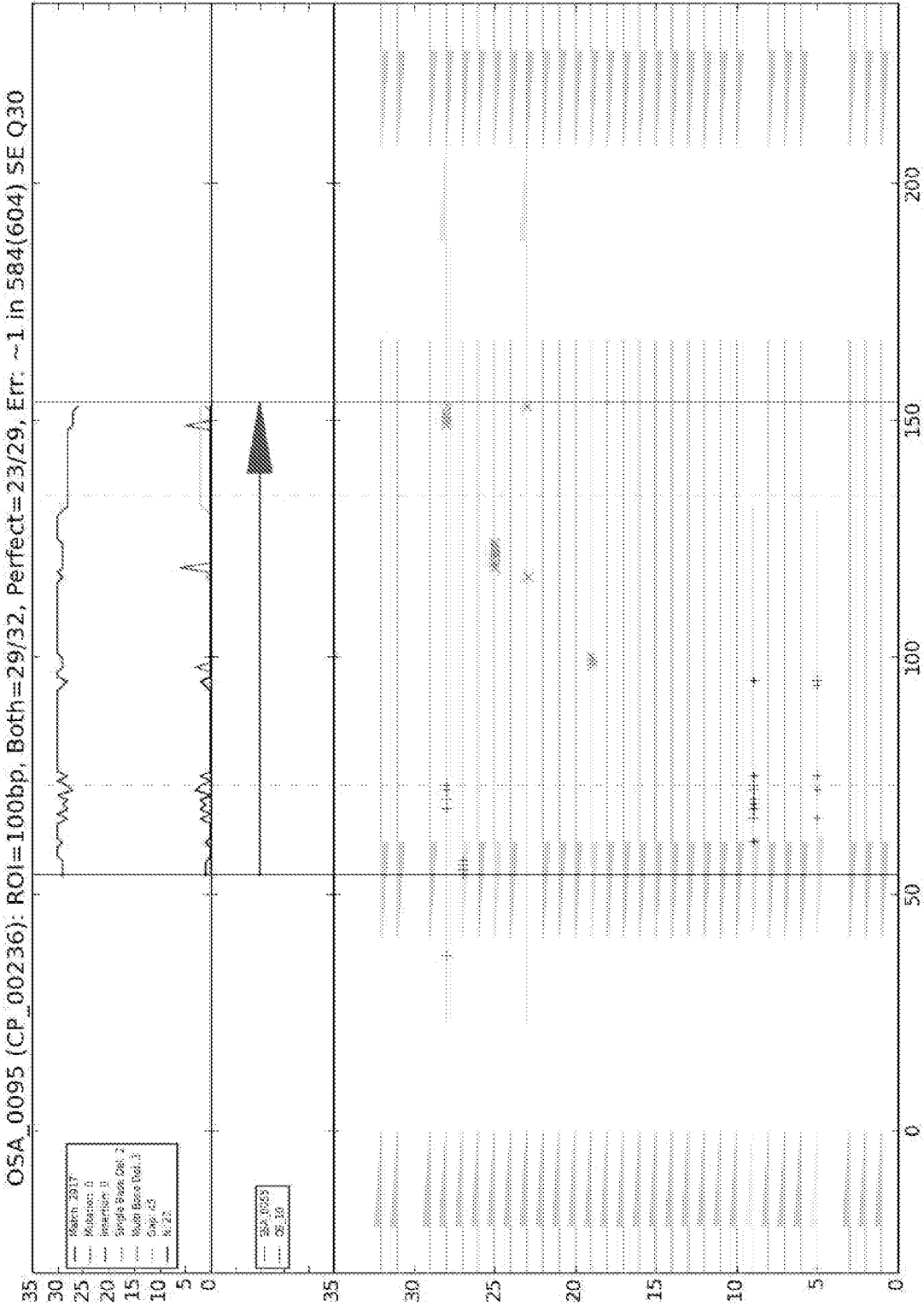


Figure 52

Error Correction

performance achieved with CorrectASE - error rate lower than 1 error in 5kb

CorrectASE treatment of a 1kb gene synthesized from low quality oligos

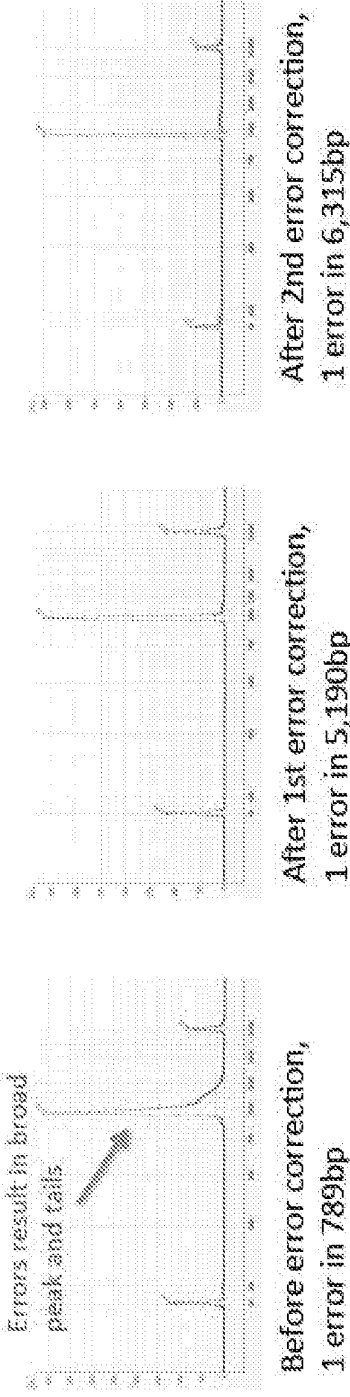


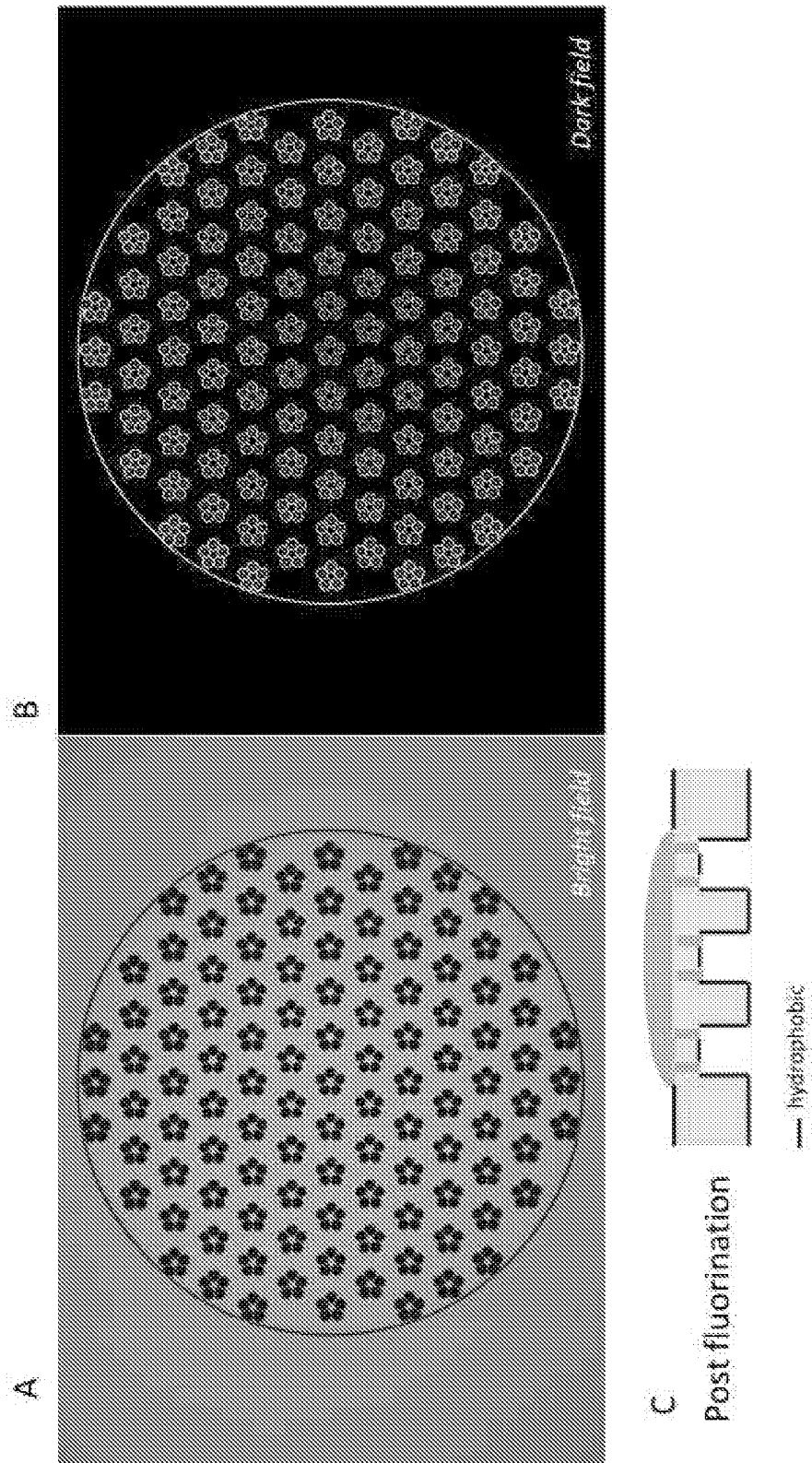
Figure 53

Figure 54

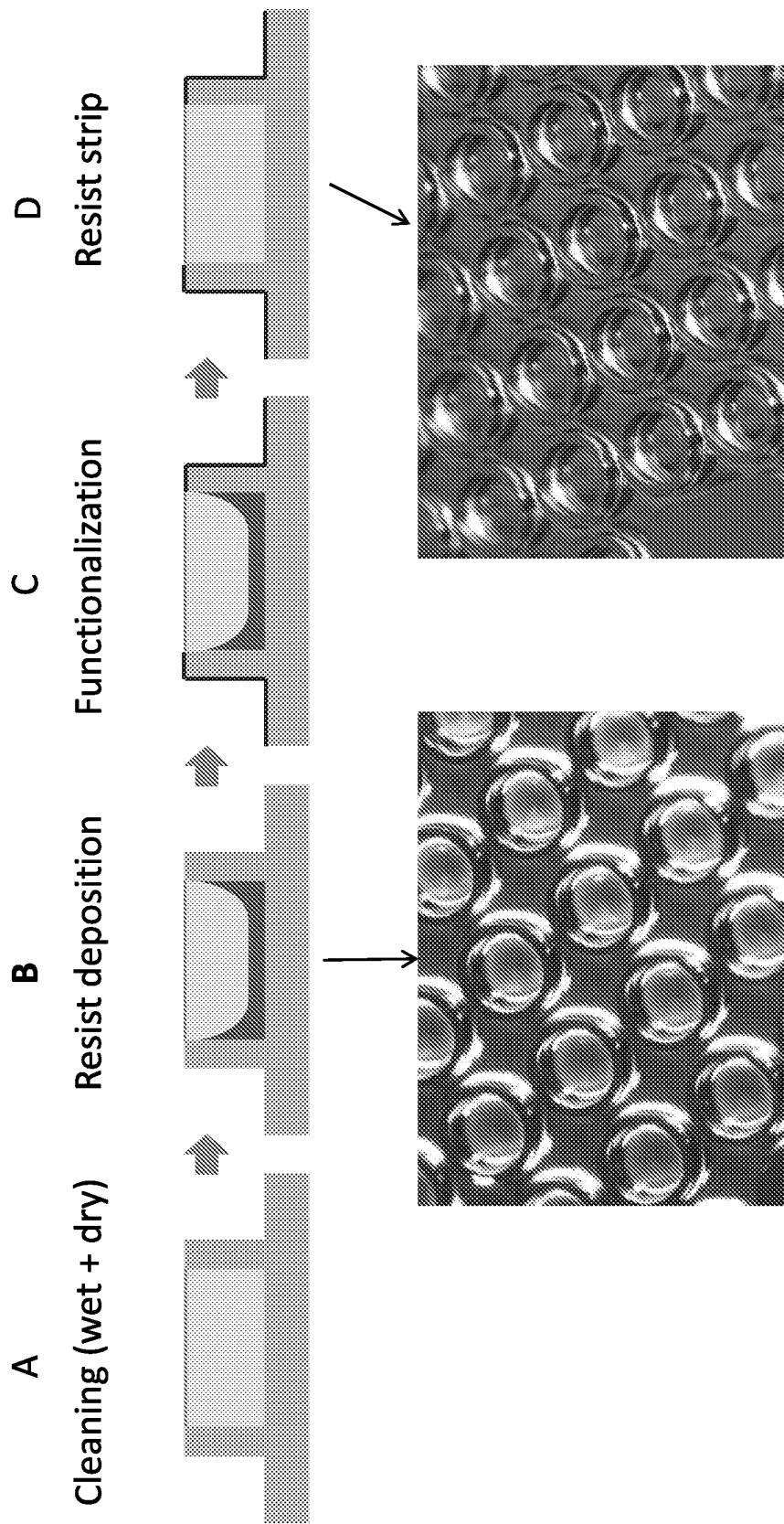


Figure 55
BioAnalyzer Results

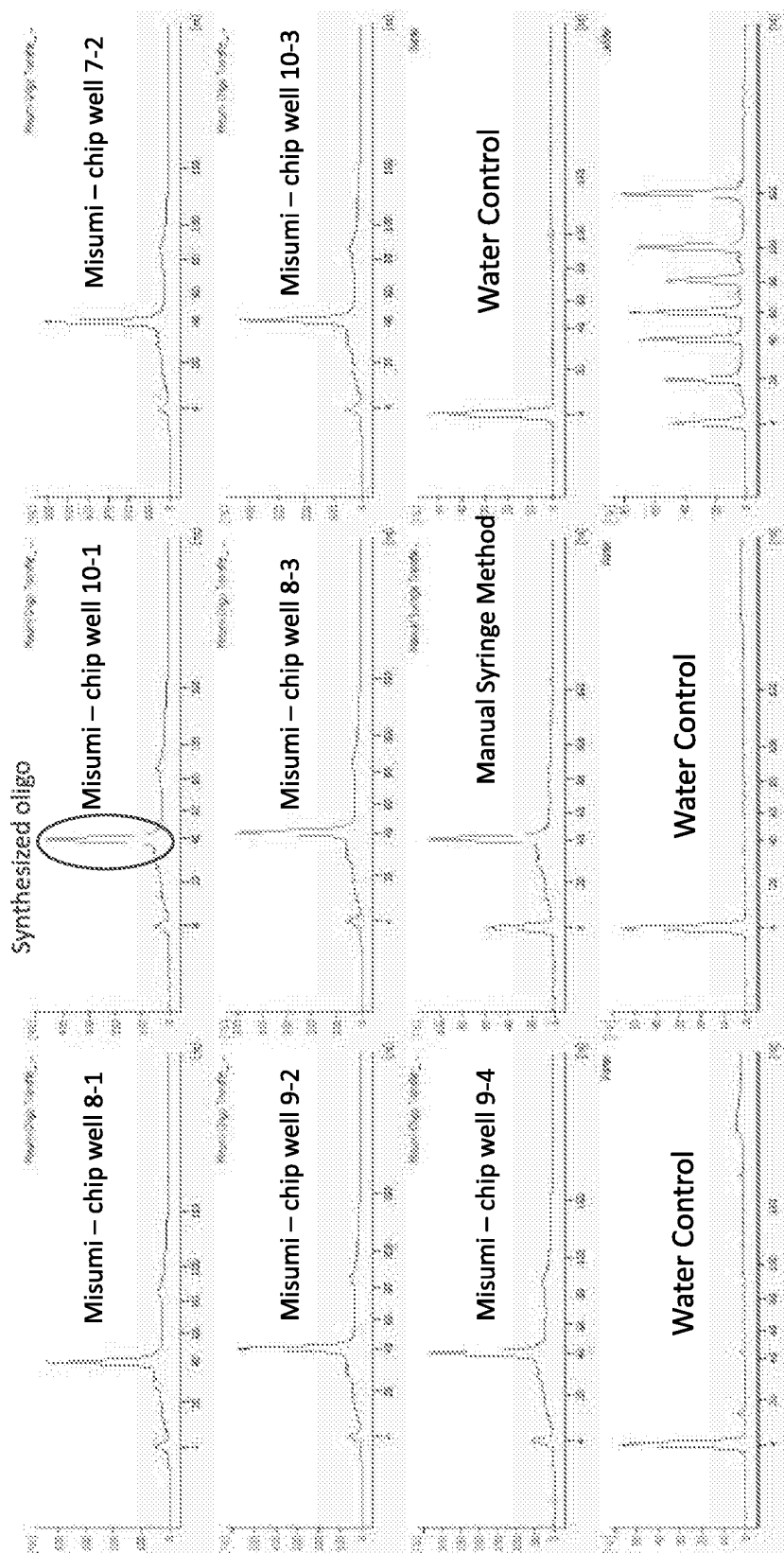


Figure 56

Point Source and Point Drain

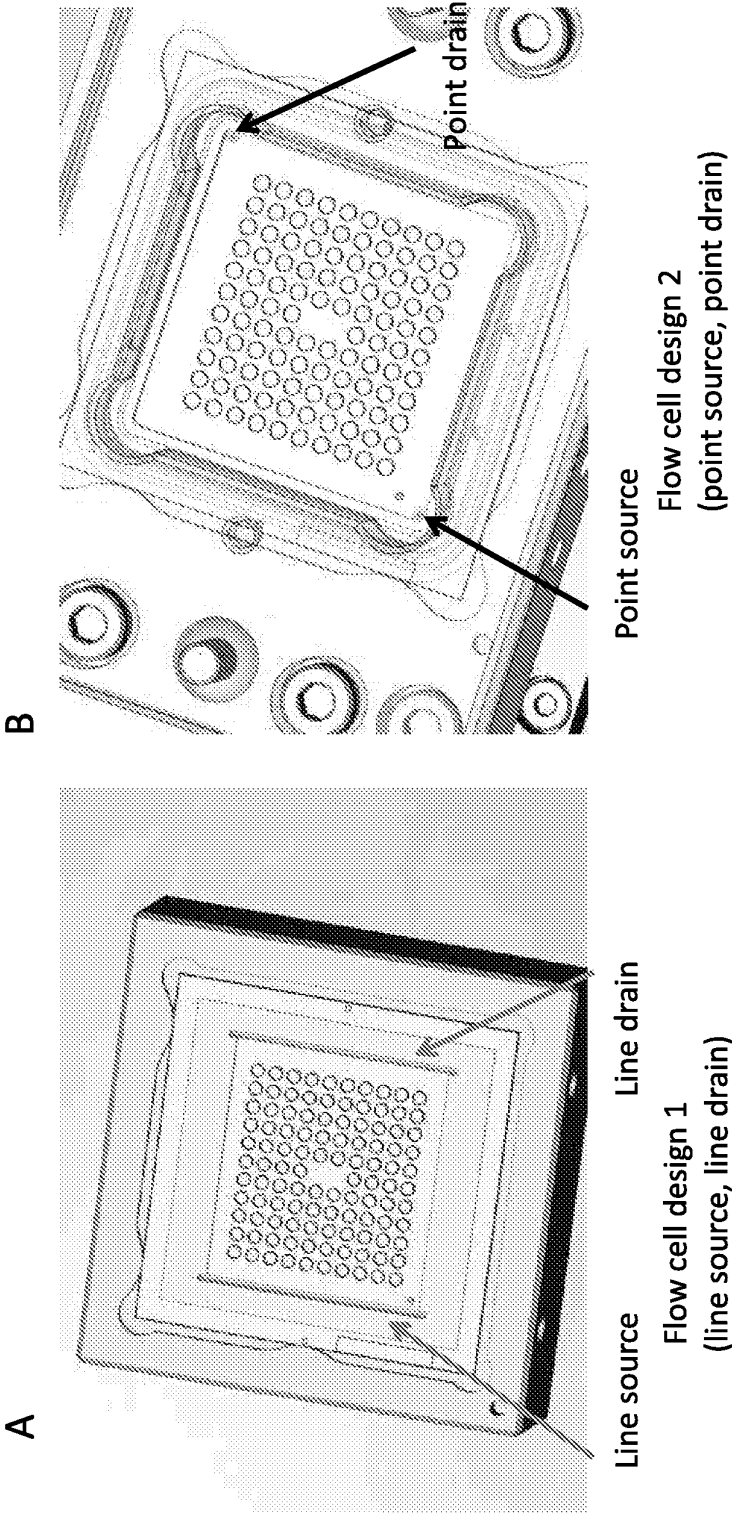
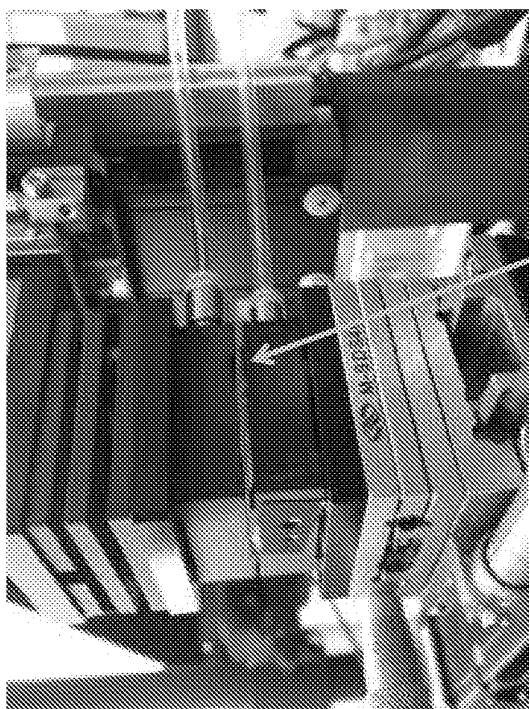


Figure 57



~ 50um gap, 10min

Figure 58

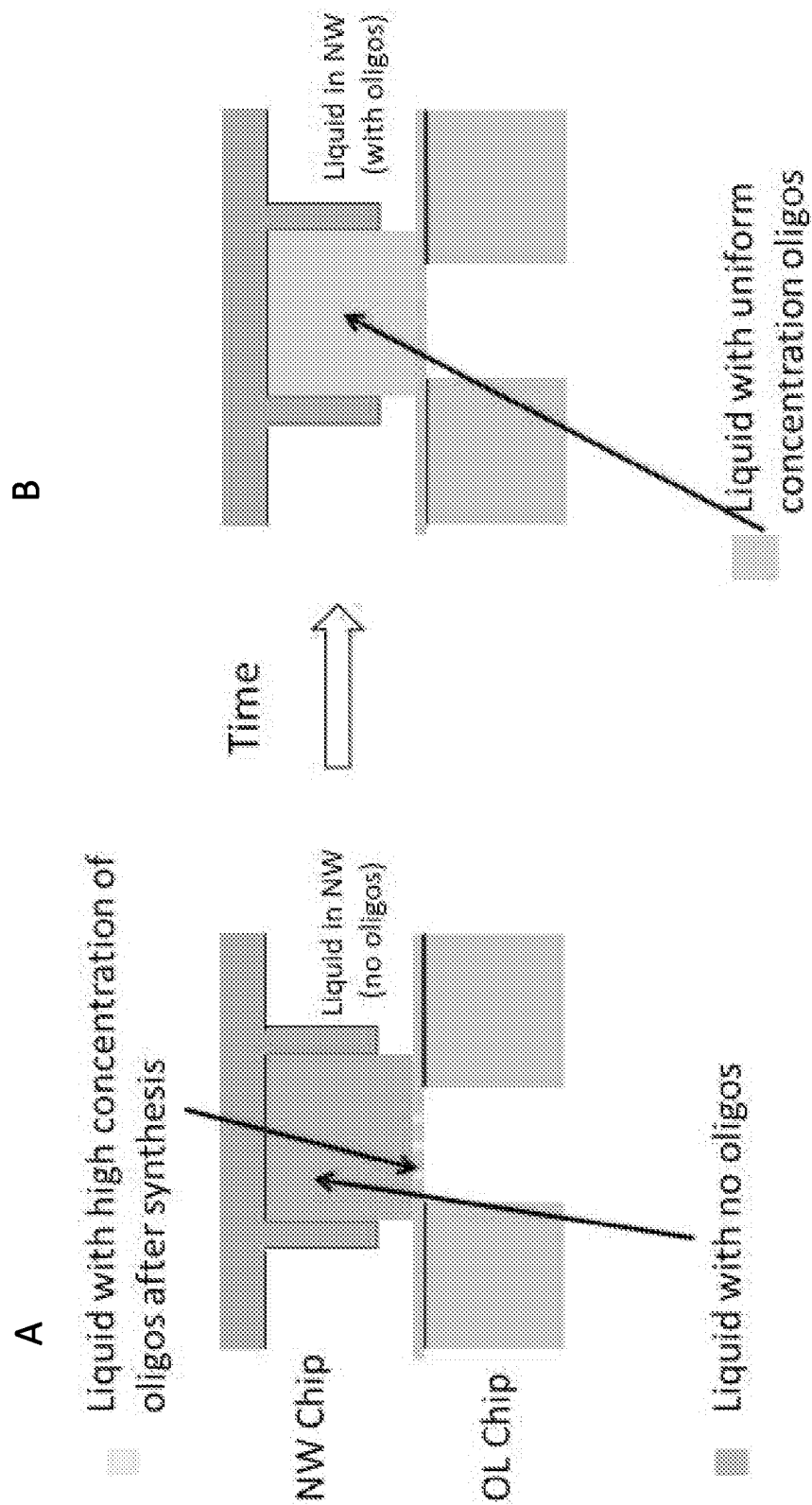
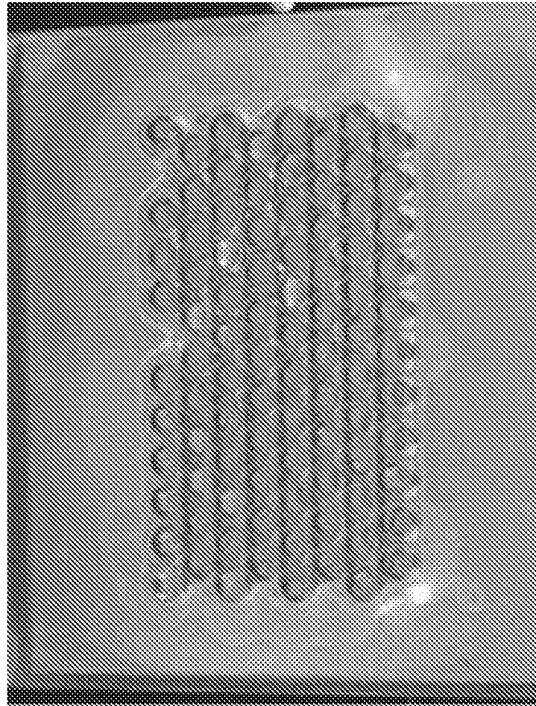
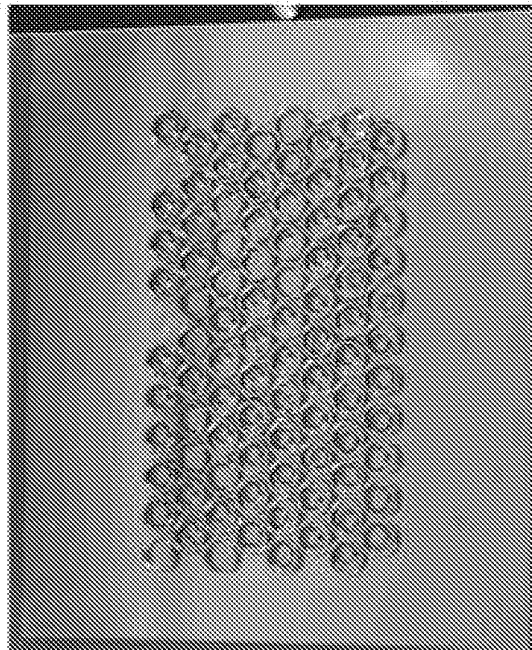


Figure 59



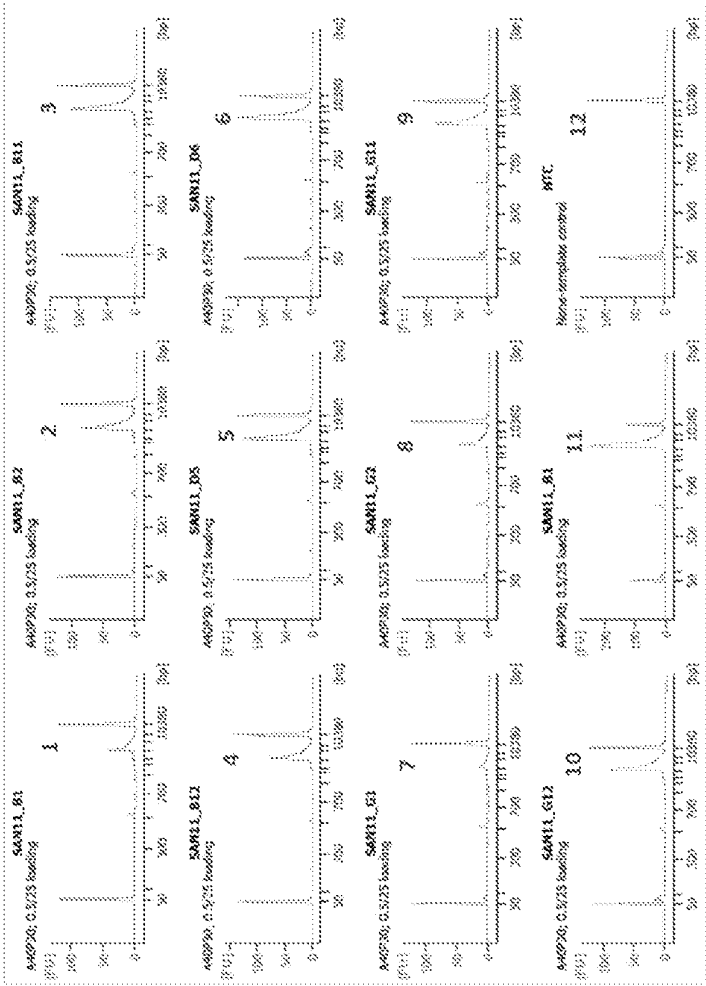
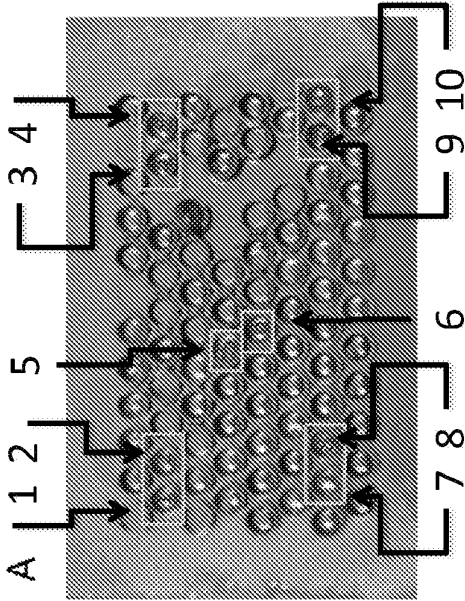
After PCA



Before PCA

Figure 60

B



C

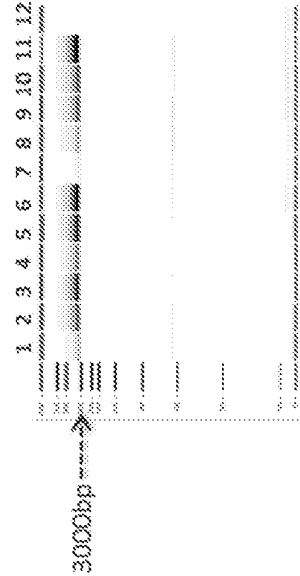


Figure 61

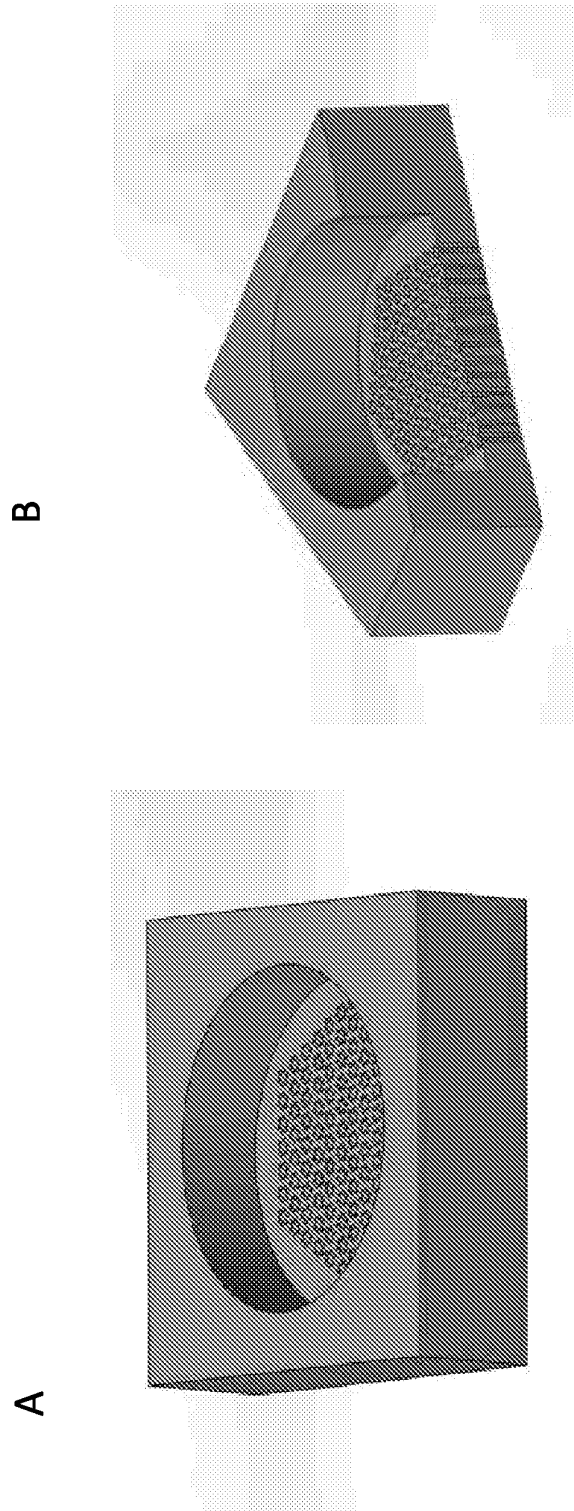


Figure 62

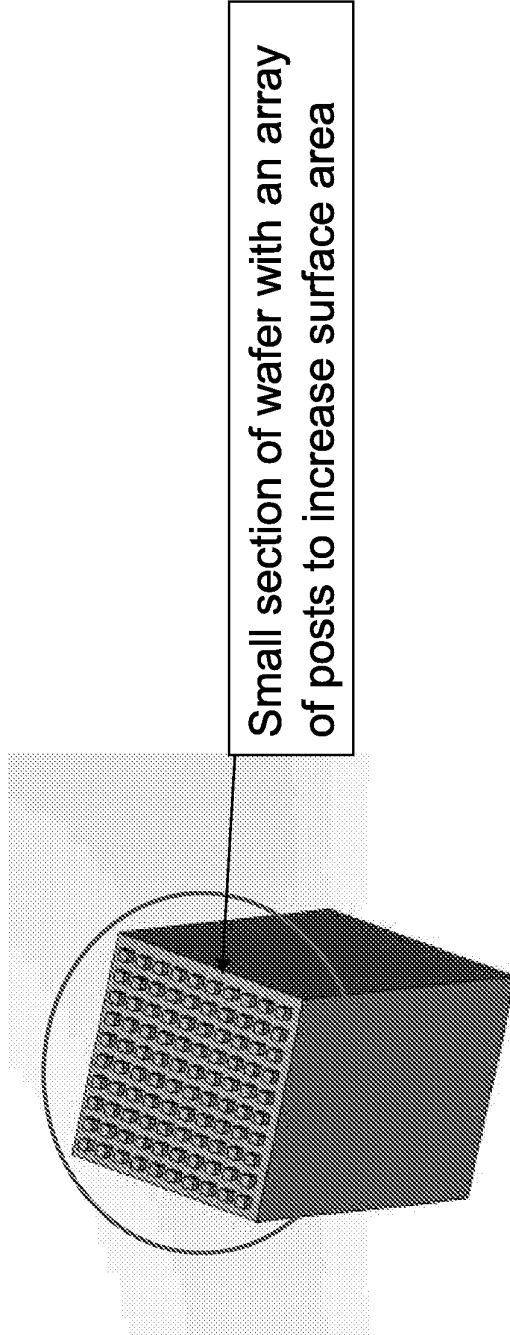


Figure 63

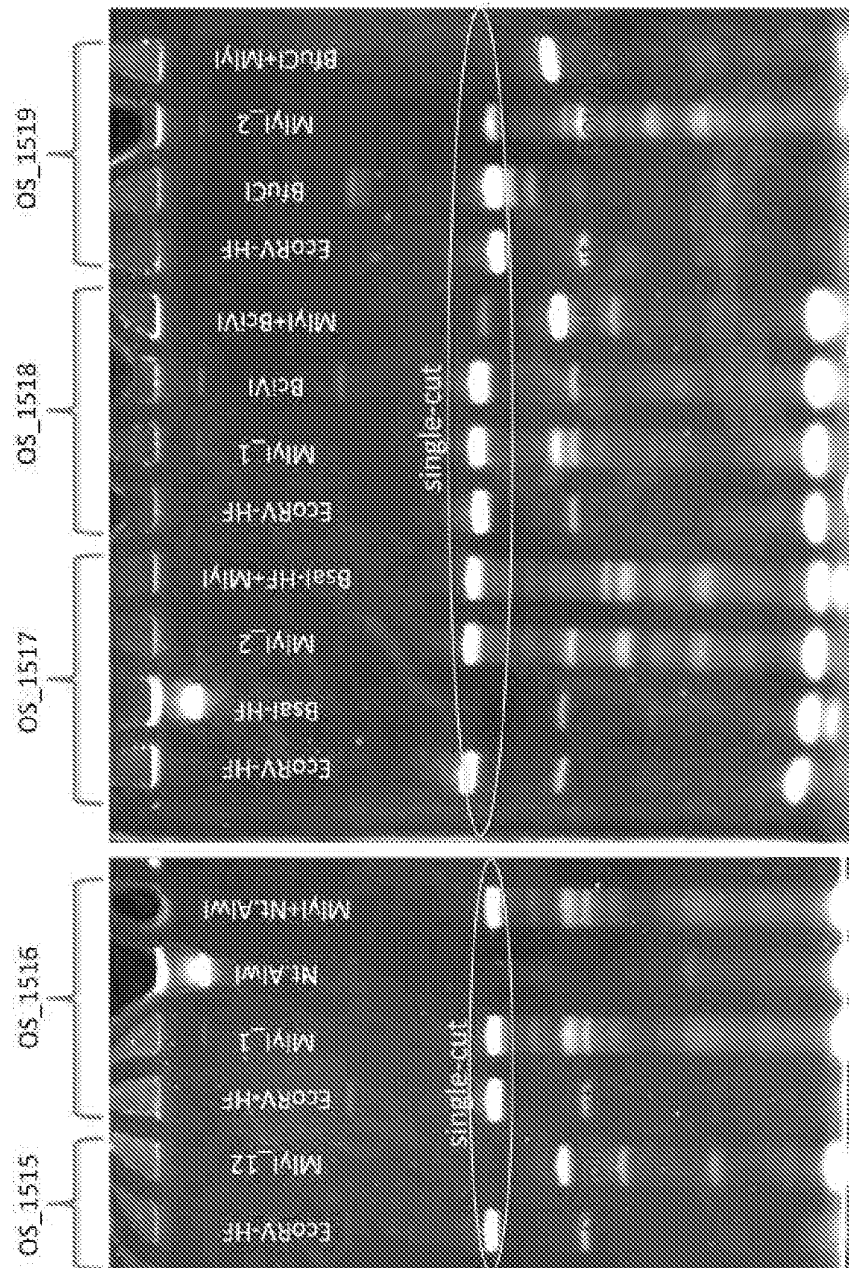


Figure 64

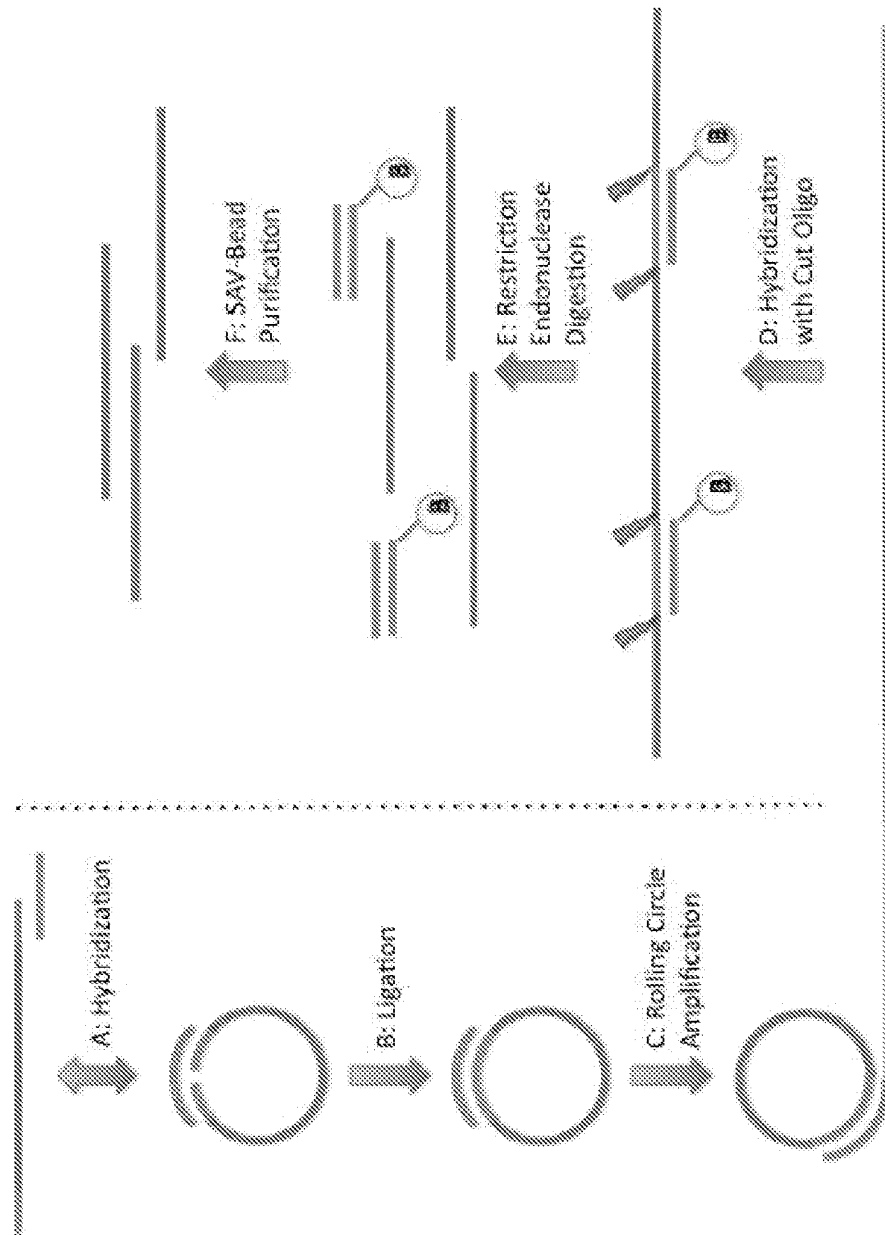


Figure 65