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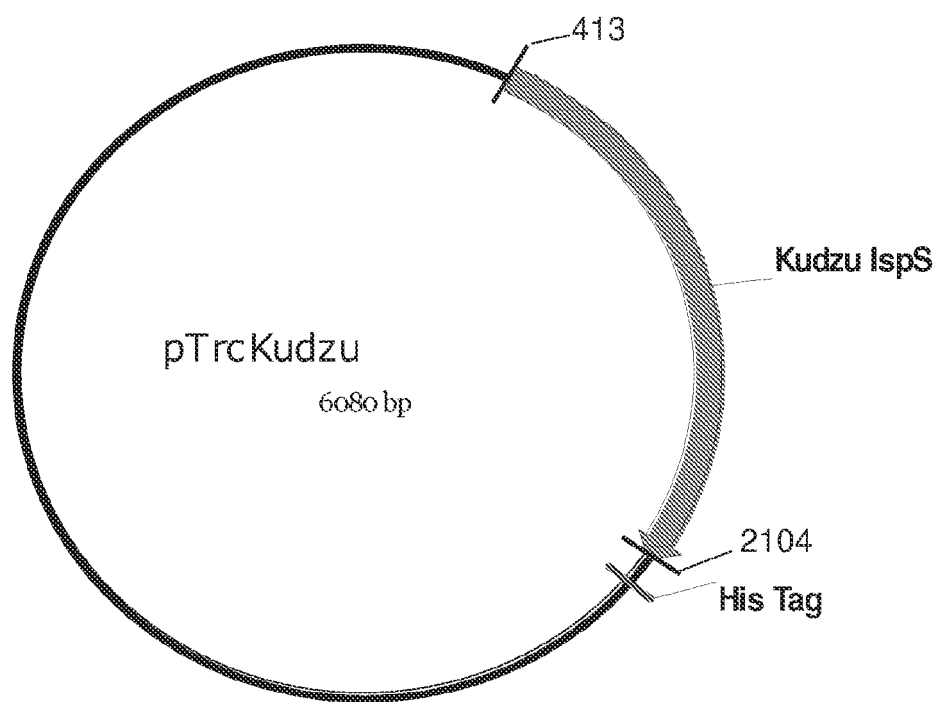


Figure 3A

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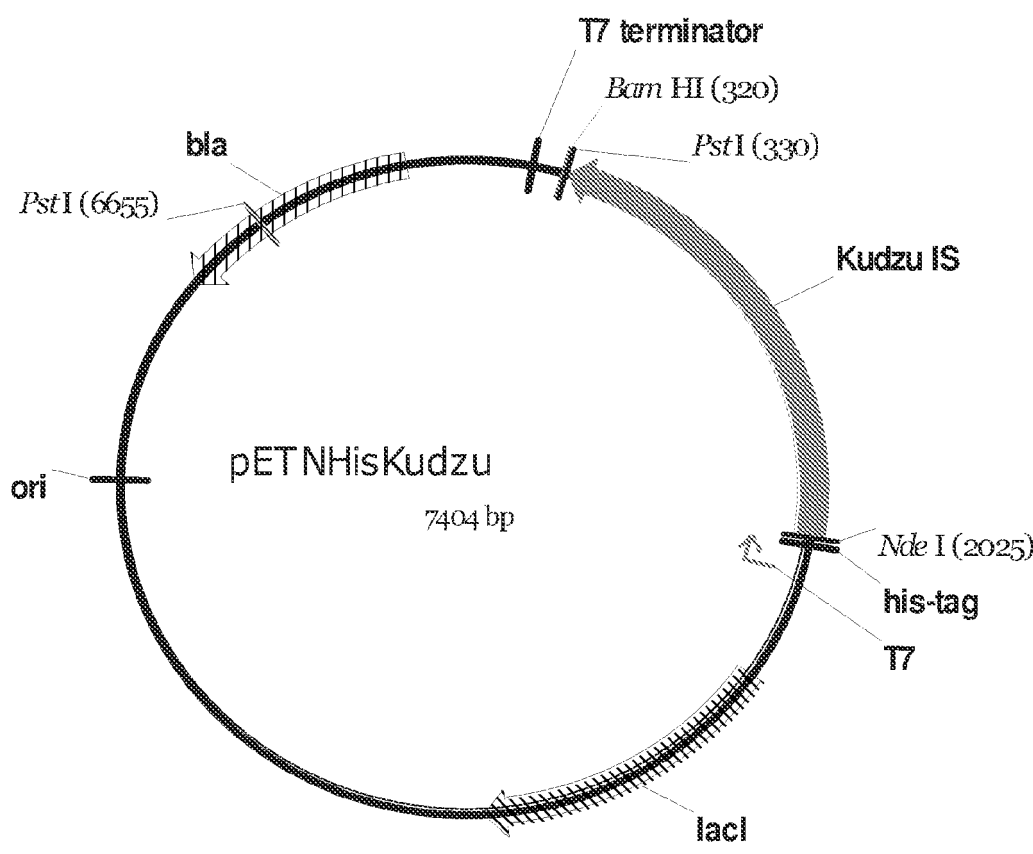
Figure 3B

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Figure 3C

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Figure 4



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Figure 5A

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Figure 5C

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(SEQ ID NO:5)

Figure 6

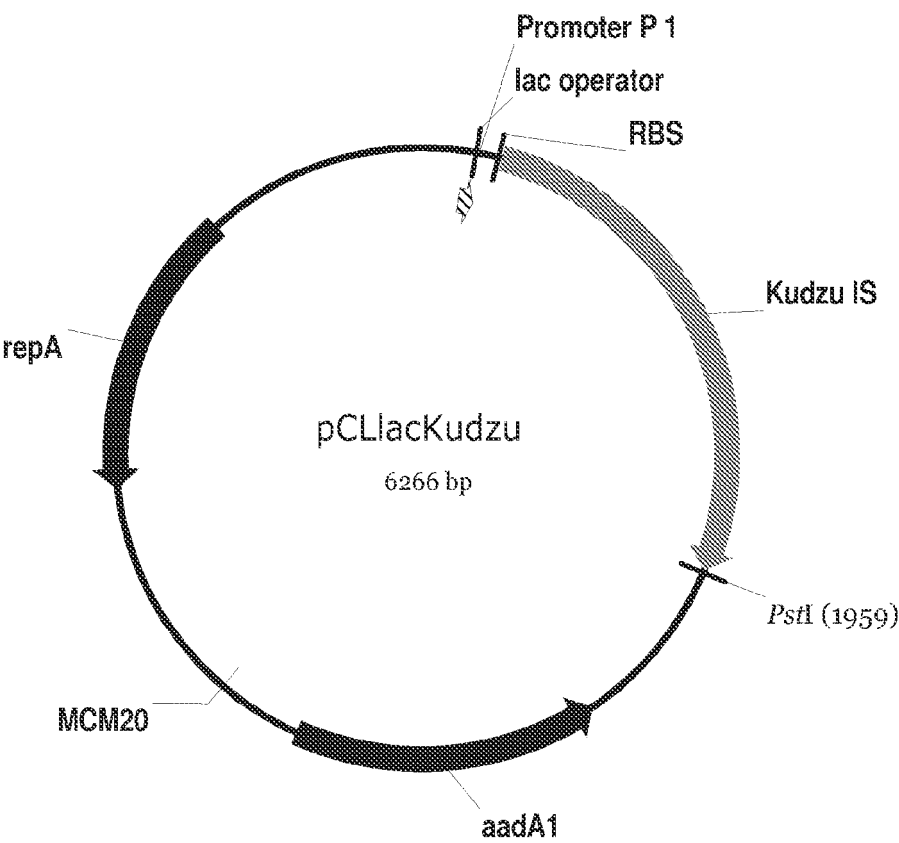


Figure 7A

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Figure 7B

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Figure 7C

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Figure 8A

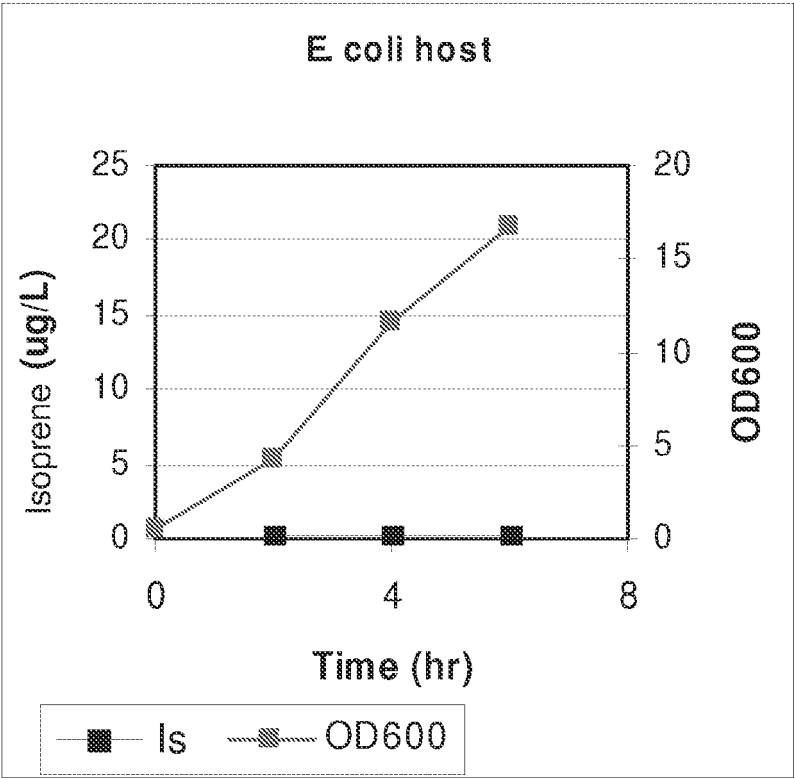


Figure 8B

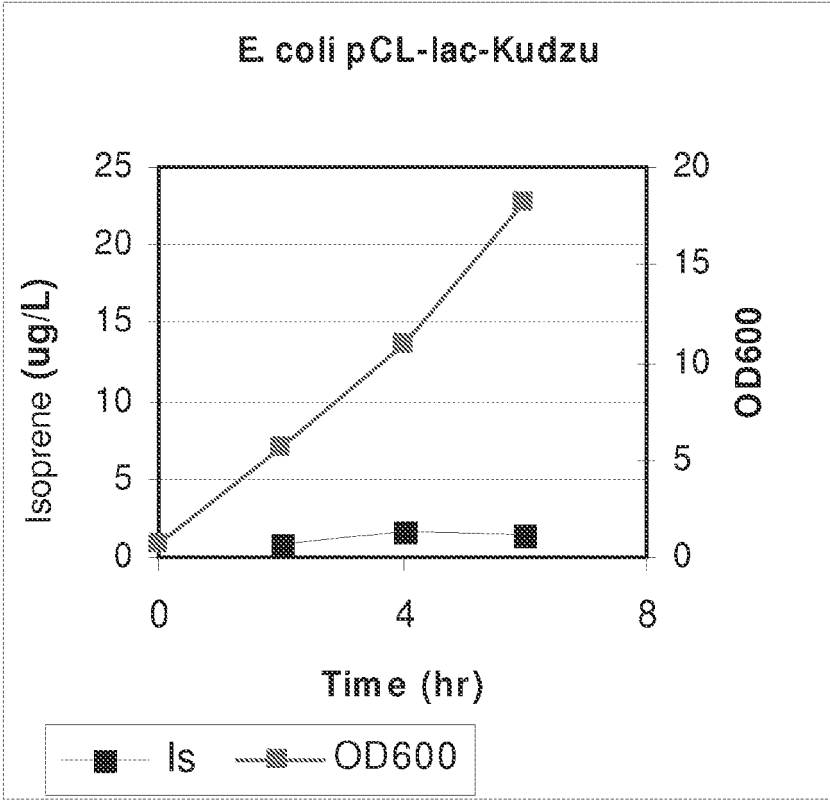


Figure 8C

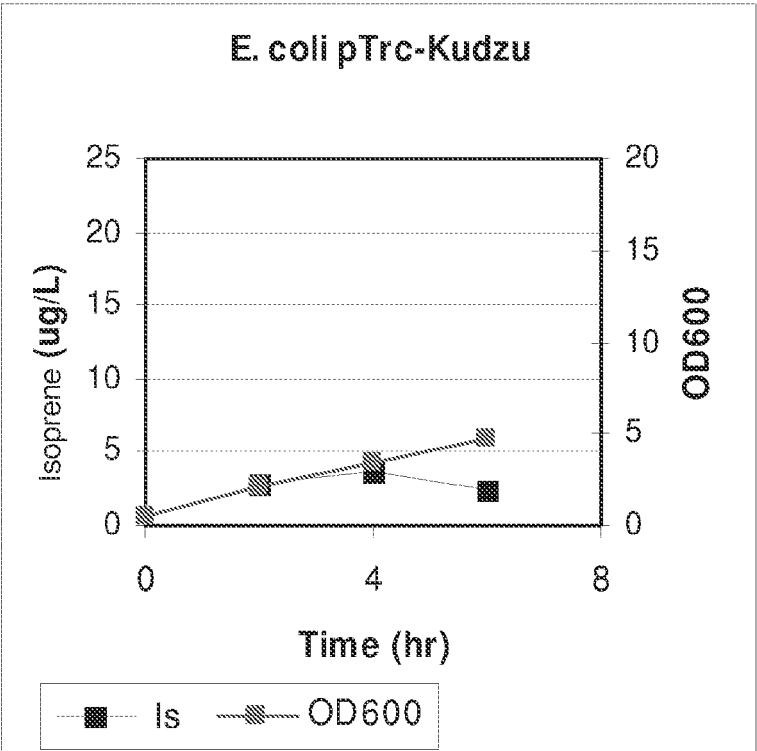


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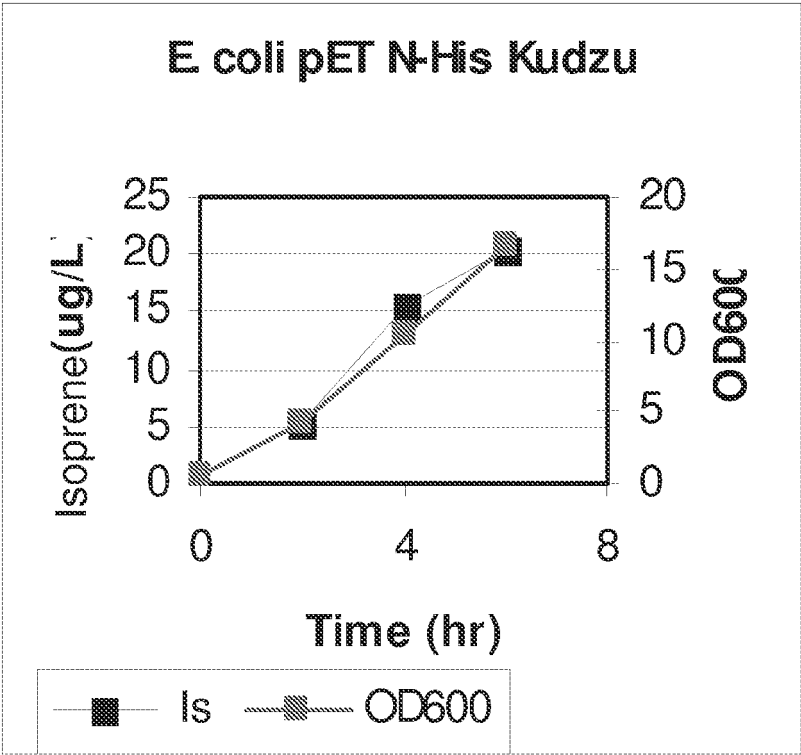
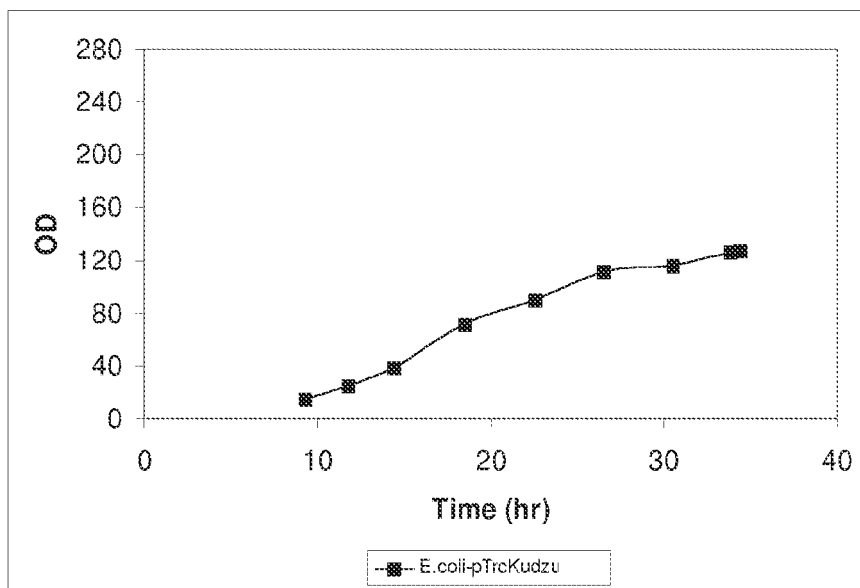


Figure 9

A.



B.

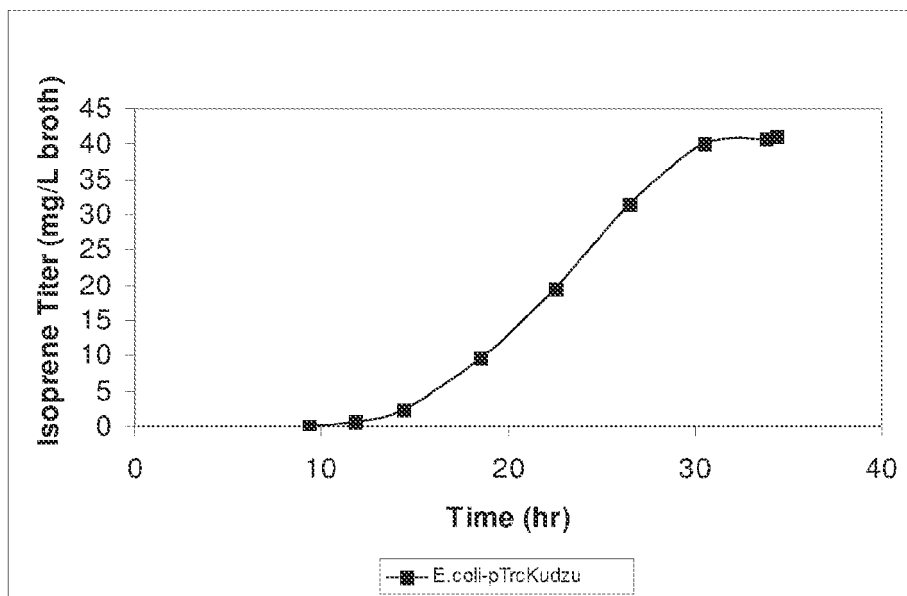


Figure 10A

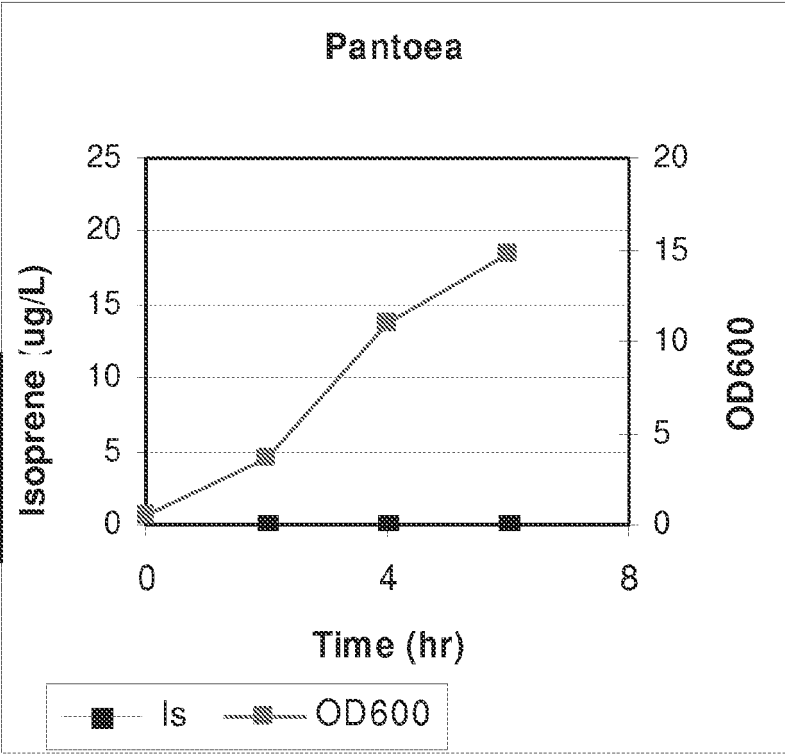


Figure 10B

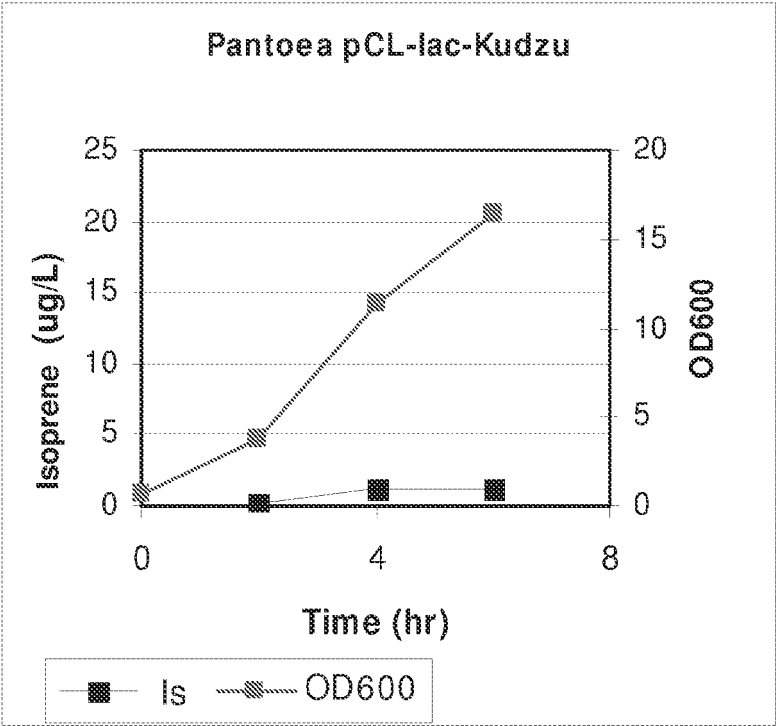
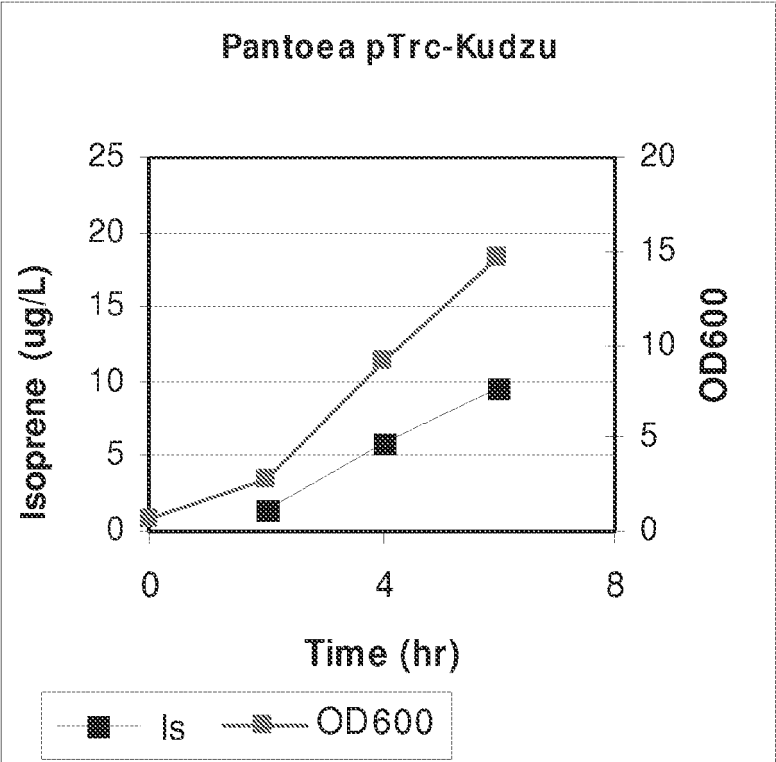


Figure 10C



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Figure 11

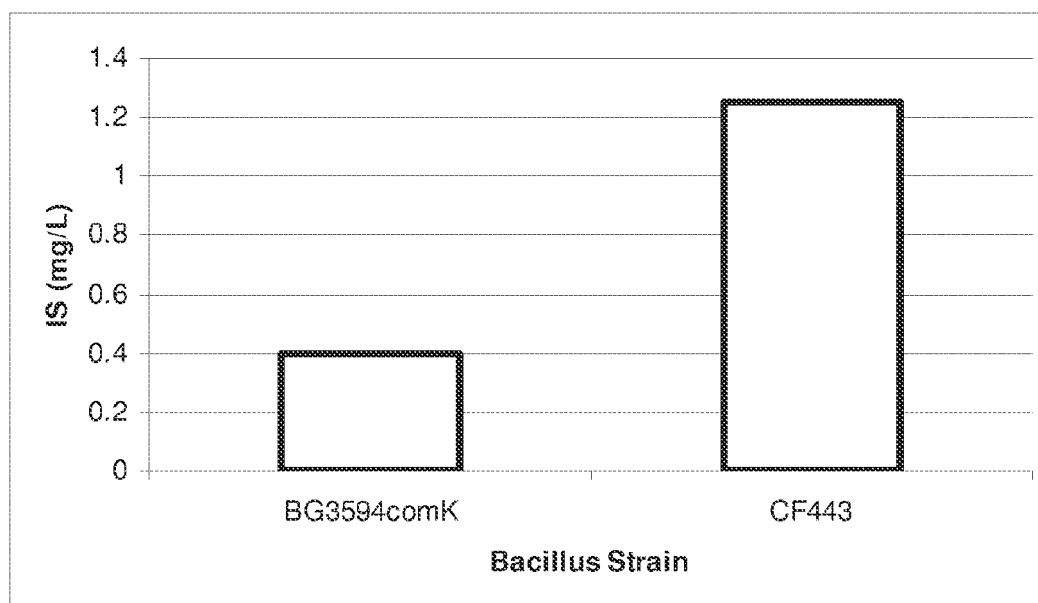


Figure 12A

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Figure 12B

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Figure 12C

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aactttaacagatgggggtttttctgtgcaaccaatttttaagggttttcaatactttaaacaca
tacataccaacacttcaacgcacctttcagcaactaaaataaaaaatgacgttatttctatatgt
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attttataaaactcattccctgatctcgacttcgttctttttttacctctcggttatgagttagt
tcaaattcgttcttttttaggttctaaatcgtgtttttcttggaattgtgctgttttatccttta
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(SEQ ID NO:57)

Figure 13

ATGTGTGCAACCTCCTCCCAGTTTACTCAGATTACCGAGCATAATTCTCGACGATCTGCTAACT
ACCAGCCGAACCTTTGGAACCTTTGAGTTTCTCCAGTCTCTCGAAAATGACCTGAAGGTGGAAAA
GCTCGAGGAGAAGGCGACCAAACTCGAGGAGGAGGTGCGATGTATGATCAACAGAGTTGACACC
CAACCCCTGCTTTTGGTGGAGCTGATCGACGATGTGCAGCGGTTGGGTTTGACTTATAAATTCTG
AGAAGGACATTATCAAGGCACTGGAGAACATTGTGCTCCTCGACGAGAACAAGAAGAACAAGTC
TGATCTTCACGCTACCGCTCTCTCTTTCCGACTTCTTCGACAACACGGCTTCGAGGTGTCGCAG
GACGTCTTTCGAGAGATTAAAGGACAAGGAGGGAGGATTTAGCGGCGAGCTGAAGGGAGACGTTT
AGGGTCTTCTCTCCTTGTACGAGGCGTCTTACCTGGGATTCGAGGGAGAGAACCCTCCTGGAGGA
AGCTCGTACATTTTCCATCACTCACCTTAAGAATAACCTTAAGGAGGGAATTAACACCAAGGTG
GCCGAGCAGGTTTCTCACGCCCTGGAGCTCCCTTACCACCAACGGCTCCATAGACTGGAGGCTC
GTTGGTTCCCTGGACAAATATGAGCCAAAGGAGCCTCATCATCAGTTGCTGTTGGAGTTGGCCAA
GCTGGACTTCAATATGGTTTCAGACGCTGCACCAAAAGGAGTTGCAGGACCTGTCTCGATGGTGG
ACCGAGATGGGATTGGCCTCGAAGCTGGATTTTGTCCGTGACCGACTTATGGAGGTCTATTTTTT
GGGCCCTTGGAAATGGCGCCTGACCCCCAGTTCGGAGAGTGCCGGAAGGCGGTGACGAAGATGTT
CGGTCTTGTGACTATCATCGACGACGTCTACGATGTCTACGGCACACTCGACGAGTTGCAGCTG
TTCACTGACGCCGTCGAGCGATGGGATGTGAACGCCATTAACTCTCCCTGACTATATGAAGC
TGTGCTTCTTGGCTCTGTACAACACTGTCAACGATACCTCGTACTCTATCCTCAAGGAGAAGGG
ACACAACAATCTCTCCTACTTGACCAAATCCTGGCGAGAAGTGTGCAAGGCTTTTCTGCAGGAG
GCTAAATGGTCCAATAACAAGATCATTCTGCTTTTTTCTAAATACCTGGAAAATGCCTCGGTGT
CGAGCTCTGGCGTCGCCCTTCTGGCCCCCTTCTACTTCTCCGTCTGCCAGCAGCAGGAGGATAT
TTCCGATCATGCTCTTAGATCGCTGACCGATTTTCACGGCCTCGTGCGATCTTCTGCGTGATT
TTTCGGTTGTGTAATGACCTTGGGACCTCTGCTGCTGAGCTGGAACGAGGCGAGACTACAAATT
CCATTATTTCTTACATGCACGAAAACGATGGAACATCTGAAGAACAGGCTAGAGAGGAACTGCG
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CCCAAGGCCCTTCATGGAGATCGCCGTGAACATGGCTCGAGTTTCCCATTTGTACTIONTACCAGTACG
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CTTCCCTATCAACCAATTGATGTACGTGTAA

(SEQ ID NO:8)

Figure 14

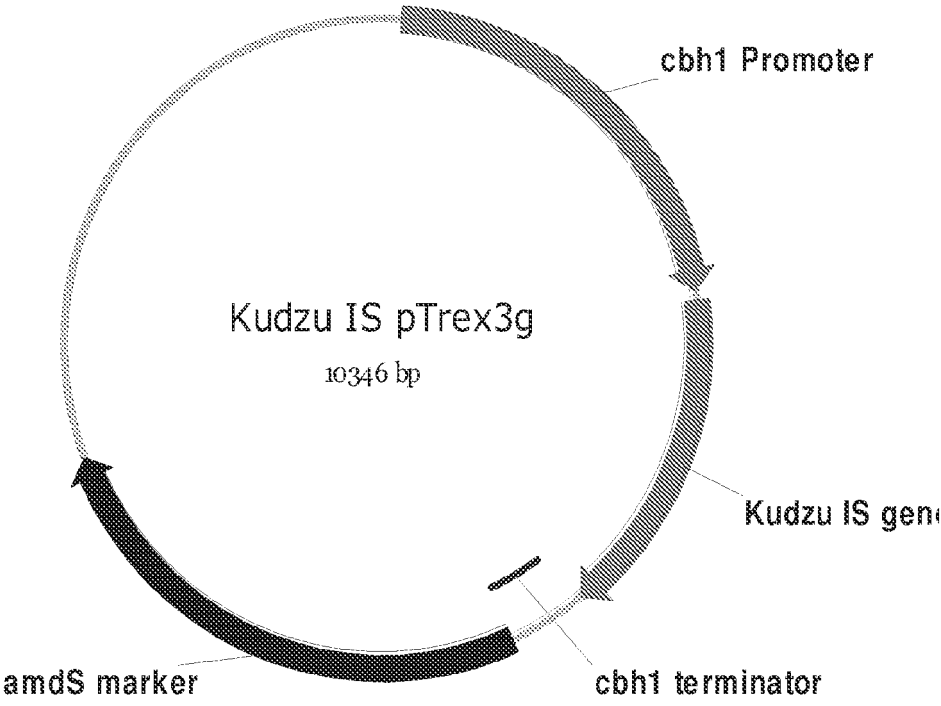


Figure 15A

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1  TCGACCGGTG AGAAGAACAG CATCGGGACA AGGGAAGGAA GAACAAAGAC AAAGAAAACA
61  AAAGAAAACA ATTGAAAACA AAACAAAACA ATTTTCATTC CTTCTCTTAT CATTCCTTTT
121 CTTTCTTTTT CTCTCAITCA ACGCACTCCA TCGIATCCGT ATTCTCTTIA TTTTTCTICT
181 TTCTCTATAT CCATTTCCTT CTCTCTAGGT GTGTCTCTCT TCTCTCTTCA ATTTCTCTAC
241 TCCGCATTCC AACGCATCCT TCCCCCAACC TCCCATTTC TCCCTACGGC CCGATAGCGA
301 TCGTCTTTCC CTCGCTATCA CTCGCTACCG GCCCCTCCCT TGCACCGTAA CCTCCTACGT
361 ATTTACCAATA TCATAAAGTT TTTTCCGAOG CTTATCGCTG ACCCCCTGTC GCCCTCCTAT
421 TGGCTTCCGG ATTATCTTCT TGTCCATAAG GTGATCCATG CTTCTGTAAG ATTCCCGAAA
481 TGTGTCCACT TTGGCGGGGA ATCATTCCAT CCACTTCCTT CTCTCTCGCT TTCTCATTC
541 GGCCTCCTCC TTCCGCGTCT CATTGGTCTT CCGCTCCGTT TTTGCTTTGC CGATGTIACT
601 TGGGAGAGAG TGCATAATC CTTTCGCAAA AACTCGGTTT GACGCCCTCC ATGGTATAAA
661 TAGTGGGTGG TGGACAGGTG CTTTCGCTTT TCTTTAAGCA AGAGAATCCC ATTTGCTTGA
721 CTATCACGAA TTCACATACA TTATGAAGAT CACCGCTGTC ATTGCCCTTT TATTCTCACT
781 TGCTGTCTGC TCACCTATTC CAGTTGCCGA TCTTGGTGTG GTTTCAGTTA GCAAGTCATA
841 TGCTGATTTT CTTCTGTGTT ACCAAAGTTG GAACACTTTT GCTAATCCTG ATAGACCCAA
901 CCTTAAGAAG AGAAATGATA CACCTGCAAG TGGATAICAA GTTGAAAAAG TCGTAATTTT
961 GTCACGTCAC GGTGTTAGGG CCCCTACAAA AATGACTCAA ACCATGCGTG ATGTCACTCC
1021 TAATACATGG CCAGAATGGC CCGTTAAAT AGGATATAT ACACCAAGAG GTGAACACTT
1081 GATATCACIT ATGGGCGGTT TTTACCGTCA AAAATTCCAG CAACAAGGAA TCCTTTCTCA
1141 GGGCTCCTGT CCTACTCCTA ACTCCATATA TGTCTGGGCT GACGTCGATC AGCGTACTTT
1201 AAAAAGTGGT GAAGCATTC TGTCTGGTTT GGCACCACAA TGTGGCTTGA CAATTCATCA
1261 CCAACAAAAT CTTGAGAAAG CTGATCCTCT TTTTCATCCC GTTAAAGCTG GAACCTGCTC
1321 TATGATAAAA ACTCAAGTTC AACAAGCTGT TGAGAAGGAG GCACAAACTC CTATAGATAA
1381 TTTGAATCAA CATTACATCC CCTTTTATAG TTTAATGAAT ACAACATTAA ATTTTAGTAC
1441 TTTGCGCTGG TGGCAAAAAC ACTCTGCTGA TAAATCCTGT GACCTAGGTT TATCCATGCC
1501 TTTCTAAATTG TCCATAAAAG ATAATGGTAA CAAGGTCGCA TTGGATGGAG CTATTTGGTCT
1561 ATCTCTACTT TTGGCCGAGA TTTTCTTCT TGAATATGCT CAAGGCATGC CTCAAGCTGC
1621 TTGGGGTAAC ATCCACTCAG AGCAAGAGTG GGCCTCCTTG CTAAAGTTGC ATAATGTTCA
1681 ATTGATTTG ATGGCCCGAA CAOCTTATAT TGCTCGACAT AACGGIATC CTTTATTGCA
1741 AGCTATATCA AATGCCCTTA ATCCCAACGC CACTGAATCA AAACCTCCAG ATATTTCACC
1801 TGATAACAAA ATATTGTTCA TTGCAGGTCA TGACACAAAT ATTGCTAATA TAGCCGGCAT
1861 GTTAAATATG CGTTGGACAT TACCAGGTCA ACCAGATAAT ACTCCTCCAG GTGGTGGCCT
1921 AGTATTTGAA CGTCTTGCTG ATAAAAGTGG AAAACAATAT GTTCTGTAT CTATGGTTTA
1981 TCAACACTTA GAACAACCTC GATCACAGAC TCCCCTTTCT CTAAATCAGC CTGCCGGATC
2041 TGTTCACACT AAAAATCCAG GTTGCAATGA TCAACACGCC GAGGGTACT GTCCCTTTTC
2101 CACITTTTACA AGAGTTGTTT CCCAATCTGT TGAACCTGGA TGCCAACTTC AATAATGAGG
2161 ATCCAAGTAA GGGAAATGAGA ATGTGATCCA CTTTAAATTC CTAATGAATA CATGCCATA
2221 GTTCTTTTCT TTGTCTCTT ATGTCTTTT TCGATGGTAC GGCCGTGTCT AATCTCAGTT
2281 TGTGTGCTTG GTTCAGCTT GGTTTCAAAT CTGTTCATCT CATGAATCTT TTACCATTTT
2341 ACCACACGTT TATACCATT TCTCATAGAA TCTTCATCAA ACCATCTCGG GGTTAGAGTG
2401 GAAAGAAAGT CTGTCTCTTT TATTTCTTT TTTCCATCTT CAAGGCTTTT CTTTCTTCC
2461 TCCCTCTCGT TCATCTTGAG GTTTGACGTG TCTGTTTAGA ATTTTGAGCT GTTGCAGCAT
2521 CTTATTTTTT GTTTTGCGAA AACGAAGCGC TTTACTCTCT TCATCAGTTG GACGATTGTA
2581 CCTTGGAAAA CCAACTACTT TTGCAITGTT TGTATAGAAA TCAATGATAT TAGAATCCCA
2641 TCCTTTAATT TCTTTCAAAG TAGTTGAGCT ATAGTTAAGT GTAAGGGCCC TACTGCGAAA
2701 GCATTTGCCA AGGATGTTTT CATTAATCAA GAACGAAAGT TAGGGGATCG AAGACGATCA
2761 GATACCGTCT IAGTCTTAAC CATAAACTAT GCCGACTAGG GATCGGGCAA TGTTTCATTT
2821 ATCGACTTGC TCGGCACCTT ACGAGAAATC AAAGTCTTTG GGTTCGGGGG GGAGTATGGT
2881 CGCAAGGCTG AAACTTAAAG GAATTGACGG AAGGGCACCA CAATGGAGTG GAGCCTGCGG
2941 CTTAATTTGA CTCACACCGG GGAAACTCAC CAGGTCCAGA CATAGTAAGG ATTGACAGAT
3001 TGAGAGCTCT TTCTTGATTC TATGGGIGGT GGTGCAIGGC CGTCTTIA GTGGGAGTG
3061 ATTTGCTGCT TTAATTGCGA TAACGAACGA GACCTTAACC TGCTAAATAG CTGGATCAGC
3121 CATTTTGGCT GATCATTAGC TTCTTAGAGG GACTAATTGC ATAAAGCCAA TGGAGTTTG
3181 AGGCAATAAC AGGTCTGTGA TGCCCTTAGA TGTCTGGGC CGCACGCGCG CTACACTGAC
3241 GGAGCCAAAG AGTTGAAAAA AATCTTTTGA TTTTATAICC TTGGCCGSA GGTCTGGGTA
3301 ATCTTGTTAA ACTCCGTCGT GCTGGGGATA GAGCATTGCA ATTATTGCGG CCGCTCCTCA
3361 ATTCGATGTT GCAGATTTTA CAAGTTTTTA AAATGTATTT CATTATTACT TTTTATATGC
3421 CTAATAAAAA AGCCATAGTT TAATCTATAG ATAACTTTTT TTCCAGTGCA CTAACCGACG

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Figure 15B

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3481 TTACATTCCC ATACAAAAC TCGTAGTTAA AGCTAAGGAA AAGTTAATAT CATGTTAATT
3541 AAATACGCTA TTTACAATAA GACATTGAAC TCAITTTATAT CGTTGAATAT GAATAACCAA
3601 TTTACGCGAA TTTTAAACAA ACATCGTTCA CCTCGTTTTA GGATATCTTG TGTATGGGGT
3661 GTTGAATTGC TTTATCGAAT AATTACCGTA CCTGTAATTG GCTTGCTGGA TATACGCGTA
3721 GTCIAATATC TAGCAAAAAT CTTTGGGGTG AAAAGGCTTG CAATTTACAG ACACCGAAGT
3781 ATTTGTCAIT TTTTAATAAG GAAGTTTTCC ATAAATTCCT GTAATICTCG GTTGATCTAA
3841 TTGAAAAGAG TAGTTTTGCA TCACGATGAG GAGGGCTTTT GTAGAAAGAA ATACGAACGA
3901 AACGAAAATC AGCGTTGCCA TCGCTTIGGA CAAAGCTCCC TTACCTGAAG AGTCGAATTT
3961 TATTGATGAA CTTATAACTT CCAAGCATGC AAACCAAAAG GGAGAACAAG TAATCCAAGT
4021 AGACACGGGA ATTGATTCTT TGGATCAGAT GTATCATGCA CTGGCTAAAC ATGCAGGCTG
4081 GAGCTTACGA CTTTACTCAA GAGGIGATTT AATCATCGAT GATCATCACA CTGCAGAAGA
4141 TACIGCTATT GCACITGGTA TTGCATTCAA GCAGGCTATG GGTAACTTTG CCGGCGTTAA
4201 AAGATTITGA CATGCTTATT GTCCACITGA CGAAGCTCTT TCTAGAAGCG TAGTTGACTT
4261 GTCGGGACGG CCTATGCTG TTATCGATT GGGATTAAAG CGTGAAAAGG TTGGGGAATT
4321 GTCCGTGTGA ATGATCCCTC ACTTACTATA TTCCCTTTTC GTAGCAGCTG GAATTACTTT
4381 GCATGTTACC TGCTTATATG GTAGTAAATGA CCATCATCGT GCTGAAAAGC CTTTTAAATC
4441 TCTGGCTGTT GCCATGCGCG CGGCTACTAG TCTTACTGGA AGTTCTGAAG TCCCAGGCAC
4501 GAAGGGAGTG TTGTAAAGAT GAATTGGATT ATGTCAGGAA AAGAACGACA ATTTTGCATC
4561 CAAATTGTCT AAATTTTAGA GTTGCTTGAA AACAAATAGAA CCTTACTTGC TTTATAATTA
4621 CGTTAATTAG AAGCGTTATC TCGTGAAGGA ATATAGTACG TAGCCGTATA AATTGAATTG
4681 AATGTTACGC TTATAGAATA GAGACACTTT GCTGTTCAAT GCGTCGTCAC TTACCATACT
4741 CACTTTATTA TACGACTTTA AGTATAAATC CCGCGGTTAT GGTAAAATTA ATGATGCACA
4801 AACGTCCGAT TCCATATGGG TACACTACAA TTAATACTTT TTAAGCTGAT CCCCCACACA
4861 CCATAGCTTC AAAATGTTTC TACTCCTTTT TACTCTTCC AGATTTTCTC GGACTCCGCG
4921 CATCGCCGTA CCACTTCAAA ACACCCAGC ACAGCATACT AAATTTTCCC TCTTTCTTCC
4981 TCTAGGCTGT CGTTAATTAC CCGTACTAAA GGTITGGAAA AGAAAAAGA GACCGCCTCG
5041 TTTCTTTTTT TTCGTCGAAA AAGGCAATAA AAATTTTAT CACGTTTCTT TTTCTTGAAA
5101 TTTTTTTTTT TAGTTTTTTT CTCTTTCAGT GACCTCCATT GATATTTAAG TTAATAAACG
5161 GTCTTCAATT TCTCAAGTTT CAGTTTCAIT TTTCTTGTT TATTACAACI TTTTACTTT
5221 CTGTGTCATT AGAAAGAAAG CATAGCAATC TAATCTAAGG GCGGTGTTGA CAATTAATCA
5281 TCGGCATAGT ATATCGGCAT AGTATAATAC GACAAGGTGA GGAACATAAC CATGGCCAAG
5341 TTGACCAGTG CCGTTCGGGT GCTCACCGCG CGCGACGTCG CCGGAGCGGT CGAGTCTGCG
5401 ACCGACCGCG TCGGTTCTC CCGGACITTC GTGGAGGACG ACTTCGCGCG TGTGTCGCG
5461 GACGACGTGA CCTGTTTCT CAGCGCGGTC CAGGACGAGG TGGTGCCGGA CAACACCTG
5521 GCTGGGGTGT GGGTGCCTCG CCTGGACGAG CTGTACGCGG AGTGGTCGGA GGTCTGTCTC
5581 ACGAATTCTC GGGACGCTCT CCGGCCCGCC ATGACCGAGA TCGGCGAGCA GCGGTGGGGG
5641 CCGGAGTTCG CCTGCGCGCA CCGGCCCGGC AACTGCGTGC ACTTCGTGCG CGAGGAGCAG
5701 GACTGACACG TCCGACGCGG CCGCACGGGT CCGAGGCTCT GGAGATCCGT CCGCTTTTTC
5761 CTTTGTGAT ATCATGTAAT TAGTTATGTC ACGCTTACAT TCACGCTCTC CCCCCACATC
5821 CGCTCTAACC GAAAAGGAAG GAGTTAGACA ACCTGAAGTC TAGTCCCTTA TTTATTTTTT
5881 TATAGTTATG TTAGTATTA GAACGTTATT TATATTTCAA ATTTTCTTT TTTTCTGTA
5941 CAGACGCGAG CTTCCAGTA AATGTGCCAT CTCGTAGGCA GAAAACGTT CCCCCGTAGG
6001 GTCTCTCTCT TGGCTCTCT TCTAGGTCGG GCTGATGCT CTTGAAGCTC TCTAGGGGGG
6061 CTCACACCAT AGGCAGATAA CGTTCCCCAC CGGCTCGCCT CGTAAGCGCA CAAGGACTGC
6121 TCCCAAAGAT CCTAGCGCGG ATTTTGCCGA TTTCGGCCTA AAGGAACCGG AACACGTAGA
6181 AAGCCAGTCC GCAGAAACGG TGCTGACCCC GGATGAATGT CAGCTACTGG GCTATCTGGA
6241 CAAGGGAAGC GCAGAGCGCA AAGAGAAAGC AGGTAGCTTG CAGTGGGCTT ACATGGCGAT
6301 AGCTAGACTG GCGGTTTTTA TGGACAGCAA GCGAACCAGA ATTGCCAGCT GGGGCGCCCT
6361 CTGTAAGGT TGGGAAGCCC TGCAAAGTAA ACTGGATGCC TTTCTTGCCG CCAAGGATCT
6421 GATGGCGCAG GGGATCAAGA TCTGATCAAG AGACAGGATG AGGATCGTTT CGCATGATTG
6481 AACAAAGATG ATTGCACGCA GGTCTCTCGG CCGCTTGGGT GGAGAGGCTA TTCGGCTATG
6541 ACTGGGCACA ACAGACAATC GGCTGCTCTG ATGCCGCCGT GTTCGGCTG TCAGCGCAGG
6601 GCGGCCCGGT TCTTTTTGTC AAGACCGACC TGTCCGGTGC CCTGAATGAA CTGCAGGACG
6661 AGGACGCGCG GCTATCGTGG CTGGCCACGA CCGGCGTTCC TTGCGCAGCT GTGCTCGACG
6721 TTGTCACCTG AGCGGGAAGG GACTGGCTGC TATTGGGCGA AGTGCCGGGG CAGGATCTCC
6781 TGTCATCTCG CCTTGTCTCT CCGGAGAAAG TATCCATCAT GGTGATGCA ATGCGGCGGC
6841 TGCATACGCT TGATCCGGCT ACCTGCCCAT TCGACCACCA AGCGAAACAT CGCATCGAGC
6901 GAGCACGTAC TCGGATGGAA CCGGCTCTTG TCGATCAGGA TGATCTGGAC GAAGAGCATC
6961 AGGGGCTCGC GCCAGCCGAA CTGTTCCGCA GGCTCAAGGC GCGCATGCCC GACGCGAGG

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Figure 15C

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7021 ATCTCGTCGT GATCCATGGC GATGCCTGCT TGCCGAATAT CATGGTGGAA AATGGCCGCT
7081 TTTCTGGATT CAACGACTGT GGCCGGCTGG GTGTGGCGGA CCGCTATCAG GACATAGCGT
7141 TGGATACCCG TGATATTGCT GAAGAGCTTG GCGGCGAATG GGCTGACCGC TTCCTCGTGC
7201 TTTACGGTAT CGCCGCTCCC GATTGCGAGC GCATCGCCTT CTATCGCCTT CTTGACGAGT
7261 TCTTCTGAAT TGA AAAAGGT ACCAAGTTA CTCATATAA CTTTAGATTG ATTTAAACT
7321 TCA TTTTAA TTTAAAAGGA TCTAGGTGAA GATCC TTTT GATAAICTCA TGACCAAAAT
7381 CCC TTAACGT GAG TTTTCGT TCCACTGAGC GTCAGACCCC GTAGAAAAGA TCAAAGGATC
7441 TTCTTGAGAT CCT TTTTTC TGCGCGTAAT CTGCTGCTTG CAAACAAAAA AACCACCGCT
7501 ACCAGCGGTG GTTTGTTTGC CGGATCAAGA GCTACCAACT CTTTTCCGA AGGTAACTGG
7561 CTT CAGCAGA GCGCAGATAC CAAATACTGT CTTCTAGTG TAGCCGTAGT TAGGCCACCA
7621 CTTCAAGAAC TCTGTAGCAC CGCCTACATA CCTCGCTCTG CTAATCCTGT TACCAGTGGC
7681 TGTGCCAGT GCGGATAAGT CGTGICTTAC CGGGTTGGAC TCAAGACGAT AGTTACCGGA
7741 TAAGGCGCAG CGGTCGGCCT GAACGGGGGG TTCGTGCACA CAGCCCAGCT TGGAGCGAAC
7801 GACCTACACC GAACTGAGAT ACCTACAGCG TGAGCATTGA GAAAGCGCCA CGCTTCCCGA
7861 AGGGAGAAAAG GCGGACAGGT ATCCGGTAAG CGGCAGGGTC GGAACAGGAG AGCGCACGAG
7921 GGAGCTTCCA GGGGGAAACG CCTGGTATCT TTATAGTCCT GTCGGGTTTC GCCACCTCTG
7981 ACTTGAGCGT CGATTTTGT GATGCTCGTC AGGGGGGCGG AGCCTATGGA AAAACGCCAG
8041 CAACGCGGCC TTTTACGGT TCCTGGCCTT TTGCTGGCCT TTTGCTCACA TGTTCTTTCC
8101 TCGGTATCC CCTGATTCTG TGGATAACCG TATTACCGCC TTTGAGTGAG CTGATACCGC
8161 TCGCCGCAGC CGAACGACCG AGCGCAGCGA G
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(SEQ ID NO:11)

Figure 16

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1 GAATTCAAAA CAAAATGTGT GCAACCTCCT CCCAGTTTAC TCAGATTACC GAGCATAATT
61 CTCGACGATC TGCTAACTAC CAGCCGAACC TTGGAACTT TGAGTTTCTC CAGTCTCTCG
121 AAAATGACCT GAAGGTGGAA AAGCTCGAGG AGAAGGCGAC CAAACTCGAG GAGGAGGTGC
181 GATGATGAT CAACAGAGTT GACACCCAAC CCCTGTCTTT GCTGGAGCTG ATCGACGATG
241 TGCAGCGGTT GGGTTTGACT TATAAATTCG AGAAGGACAT TATCAAGGCA CTGGAGAACA
301 TTGIGCTCCT CGACGAGAAC AAGAAGAACA AGTCTGATCT TCACGCTACC GCTCTCTCTT
361 TCCGACTTCT TCGACAACAC GGCCTTCGAGG TGTGCGAGGA CGTCTTCGAG AGATTTAAGG
421 ACAAGGAGGG AGGATTTAGC GCGGAGCTGA AGGGAGACGT TCAGGGTCTT CTCTCCTTGT
481 ACGAGGCGTC CTACCTGGGA TTCGAGGGAG AGAACCTCCT GGAGGAAGCT CGTACATTTT
541 CCATCACTCA CCTTAAGAAT AACCTTAAGG AGGGAATTAA CACCAAGGTG GCCGAGCAGG
601 TTTCTCACGC CCTGGAGCTC CCCTACCACC AACGGCTCCA TAGACTGGAG GCTCGTTGGT
661 TCCGGGACAA ATATGAGCCA AAGGAGCCTC ATCATCAGTT GCTGTGGAG TTGGCCAAGC
721 TGGACTTCAA TATGGTTCAG ACGCTGCACC AAAAGGAGTT GCAGGACCTG TCTCGATGGT
781 GGACCGAGAT GGGATTGGCC TCGAAGCTGG ATTTTGTCCG TGACCGACTT ATGGAGGTCT
841 ATTTTGGGC CCTTGAATG GCGCCTGACC CCCAGTTCCG AGAGTGCCGG AAGGCGGTGA
901 CGAAGATGTT CGGTCTTGTG ACTATCATCG ACGACGTCTA CGATGTCTAC GGCACACTCG
961 ACGAGTTGCA GCTGTTCACT GACGCCGTGG AGCGATGGGA TGTGAACGCC ATTAAIACTC
1021 TCCCTGACTA TATGAAGCTG TGCTTCCTGG CTCTGTACAA CACTGTCAAC GATACCTCGT
1081 ACTCTATCCT CAAGGAGAAG GGACACAACA ATCTCTCCTA CTTGACCAA TCCTGGCGAG
1141 AACTGTGCAA GGCTTTTCTG CAGGAGGCTA AATGGTCCAA TAACAAGATC ATTCTGTCTT
1201 TTTCTAAATA CCTGGAAAAT GCCTCGGTGT CGAGCTCTGG CGTCGCCCTT CTGGCCCCCT
1261 CTACTTCTC CGTCTGCCAG CAGCAGGAGG ATATTTCCGA TCAIGCTCTT AGATCGCTGA
1321 CCGATTTTCA CGGCCTCGTG CGATCTTCCT GCGTGATTTT TCGGTTGTGT AATGACCTTG
1381 CGACCTCTGC TGCTGAGCTG GAACGAGGCG AGACTACAAA TTCCATTATT TCCTACATGC
1441 ACGAAAACGA TGGACATCT GAAGAACAGG CTAGAGAGGA ACTGCCAAG TTGATCGACG
1501 CCGAGTGGAA GAAGATGAAC AGAGAGCGGG TGTCCGACTC TACCTGTCTT CCCAAGGCCT
1561 TCATGGAGAT CGCCGTGAAC ATGGCTCGAG TTTCCCATTG TACTTACCAG TACGGTGACG
1621 GCCTGGGTCTG TCCGGACTAC GCTACAGAGA ACCGAATCAA GCTGCTGCTC ATCGACCCCT
1681 TCCCTATCAA CCAATTGATG TACGTGTAAT AGTCTAGAGG ATCC
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(SEQ ID NO:12)

Figure 17

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1  GAATTCACA AAAATGTGCT CTGTTTCCAC TGAGAACGTG TCCTTTACTG AGACTGAGAC
61  TGAAGCACGT AGAAGCGCCA ACTACGAACC CAACTCCTGG GATTATGACT TTCTGCTGTC
121 TTCTGACACC GACGAGTCGA TCGAGGTTTA TAAGGATAAG GCCAAGAAAC TTGAGGCCGA
181 GGTGAGACGA GAGATTAAAC ACGAGAAGGC CGAGTTCCTG ACCCTTCTTG AGCTGATCGA
241 CAACGTTCAA CGACTTGGTC TTGGTTACCG TTTCGAATCC GATATCCGAC GTGCATTGGA
301 TCGATTTGTC TCGTCCGGAG GTTTCGATGG TGTGACTAAG ACGTCGCTGC ACGCCACAGC
361 TCTTTCCTTC AGACTGTTCG GGCAGCATGG ATTTGAGGTT TCCCAGGAAG CCTTTTCTGG
421 TTTC AAGGAT CAGAACGGAA ACTTTTIGGA GAATCTCAAG GAGGACACCA AGGCCATCCT
481 GTCGTTGTAT GAGGCCTCGT TCCTGGCTCT TGAGGGCGAG AATATTCTGG ATGAGGCTCG
541 GGTTTTTCGCT ATTTCCGACC TGAAGGAGTT GTGGGAGGAA AAGATCGGAA AGGAACTGGC
601 CGAGCAGGTC AACCATGCAC TTGAACCTCC CCTGCATCGA CGTACCCAGC GACTGGAGGC
661 CGTGTGGAGC ATCGAGGCGT ACAGAAAAAA GGAGGATGCT AATCAGGTTT TGCTCGAACT
721 CGCTATCCTC GACTATAACA TGATTGAGAG CGTGTAACAG CGTGACTTGC GAGAGACAAG
781 CCGGTGGTGG CGACGGGTGG GACTGGCCAC GAAGCTCCAC TTTGCTAAAG ATCGATTGAT
841 TGAGTCGTTT TACTGGGCAG TGGGTGTGGC CTTTGAGCCT CAGTACTCCG ACTGCCGAAA
901 CTCCGTTGCA AAGAATGTTT CTTTTGTGAC TATCATCGAC GACATCTACG ATGTTTACGG
961 CACTCTCGAT GAACTCGAAC TCTTCACGGA CGCTGTCGAG CGATGGGATG TGAATGCCAT
1021 TAATGATCTG CCAGATTATA TGAAGTTGTG TTTCTTGGCG CTCTACAACA CAATTAATGA
1081 AATTGCCTAC GACAACCTCA AGGACAAGGG AGAGAACATT CTGCCCTACC TTACTAAAGC
1141 CTGGGCCGAC CTGTGTAACG CCTTTTIGCA GGAAGCCAAG TGGCTCTATA ACAAACTTAC
1201 TCCTACATTT GATGACTACT TCGGCAACGC TTGGAAGTCT TCCAGCGGCC CTCCTCAGTT
1261 GATCTTCGCT TACTTTGCAG TGGTCCAGAA CATCAAGAAA GAGGAGATTG AGAACCTCCA
1321 GAAGTATCAC GACAATCATCT CCCGACCTTC GCACATCTTT CGACTGTGCA ATGACCTTGC
1381 CTCGCGATCC GCTGAGATTG CCCGAGGAGA AACAGCCAAT TCTGTGTCGT GTTACATGCG
1441 TACAAAGGGC ATCTCCGAGG AGCTGGCTAC CGAGTCTGTG ATGAACCTGA TCGATGAAAC
1501 CTGTAAGAAG ATGAACAAAG AGAAACGGG CGGTTCTCTG TTCGCCAAAC CATTGTGTTGA
1561 AACC GCGATC AATCTGGCTC GTCAGTCTCA TTGTACTTAC CATAACGGTG ACGCGCACAC
1621 TTCGCCGGAC GAATTGACCC GTAAGCGTGT GCTTTCGGTG ATTACCGAGC CGATCCTGCC
1681 GTTCGAAAGA TAATAGGATC C
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(SEQ ID NO:13)

Figure 18A1

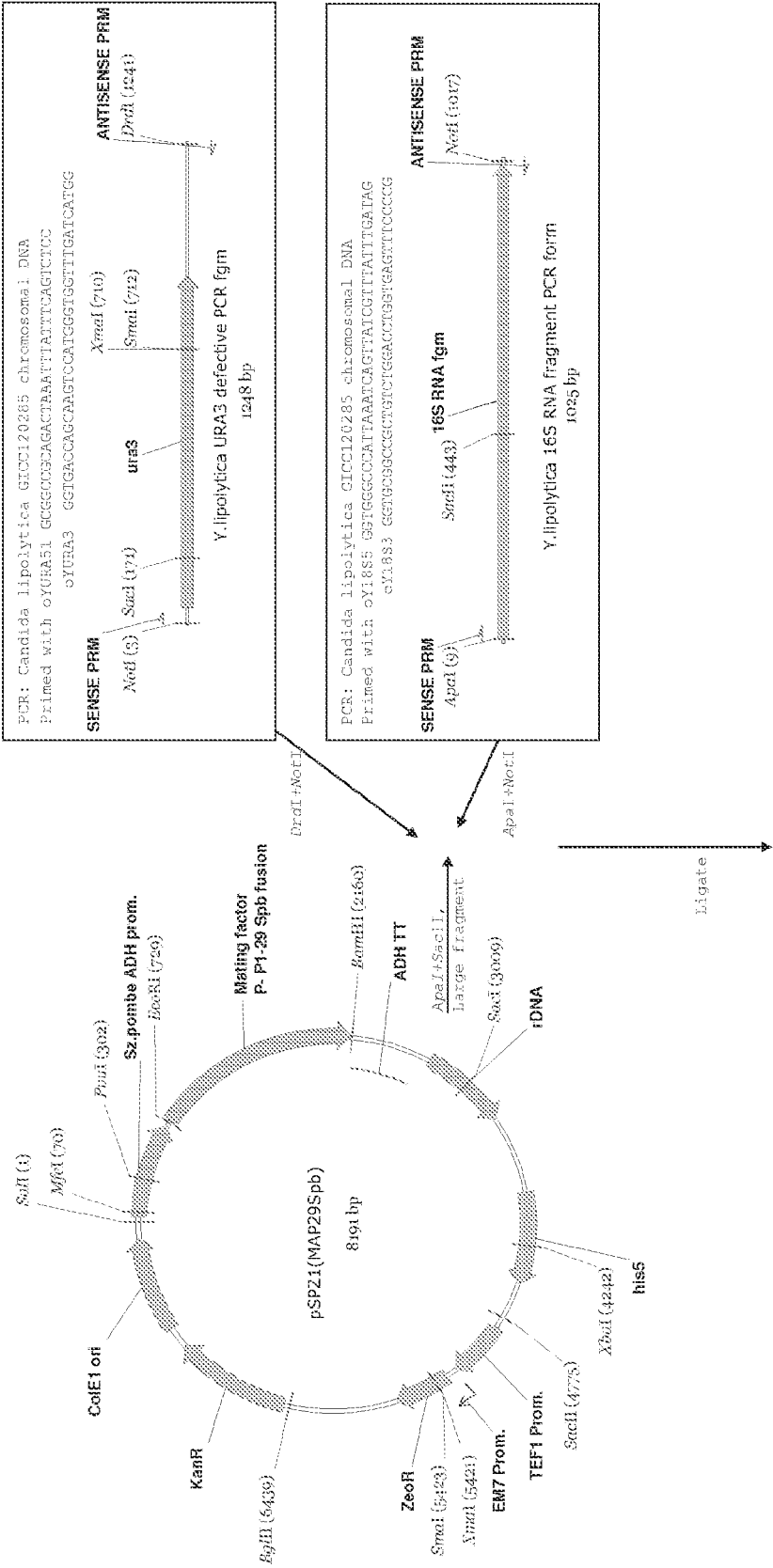


Figure 18A2

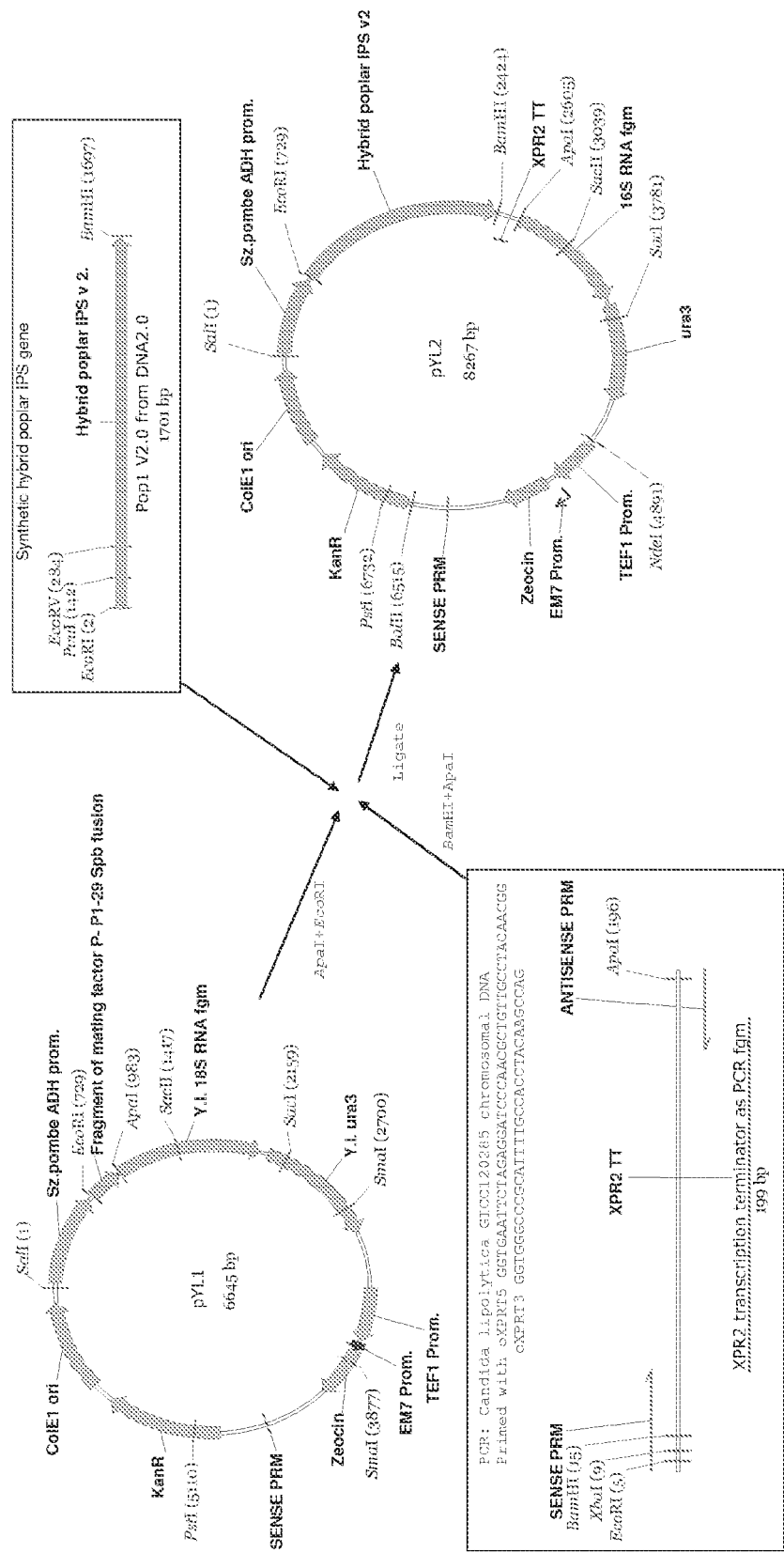


Figure 18C

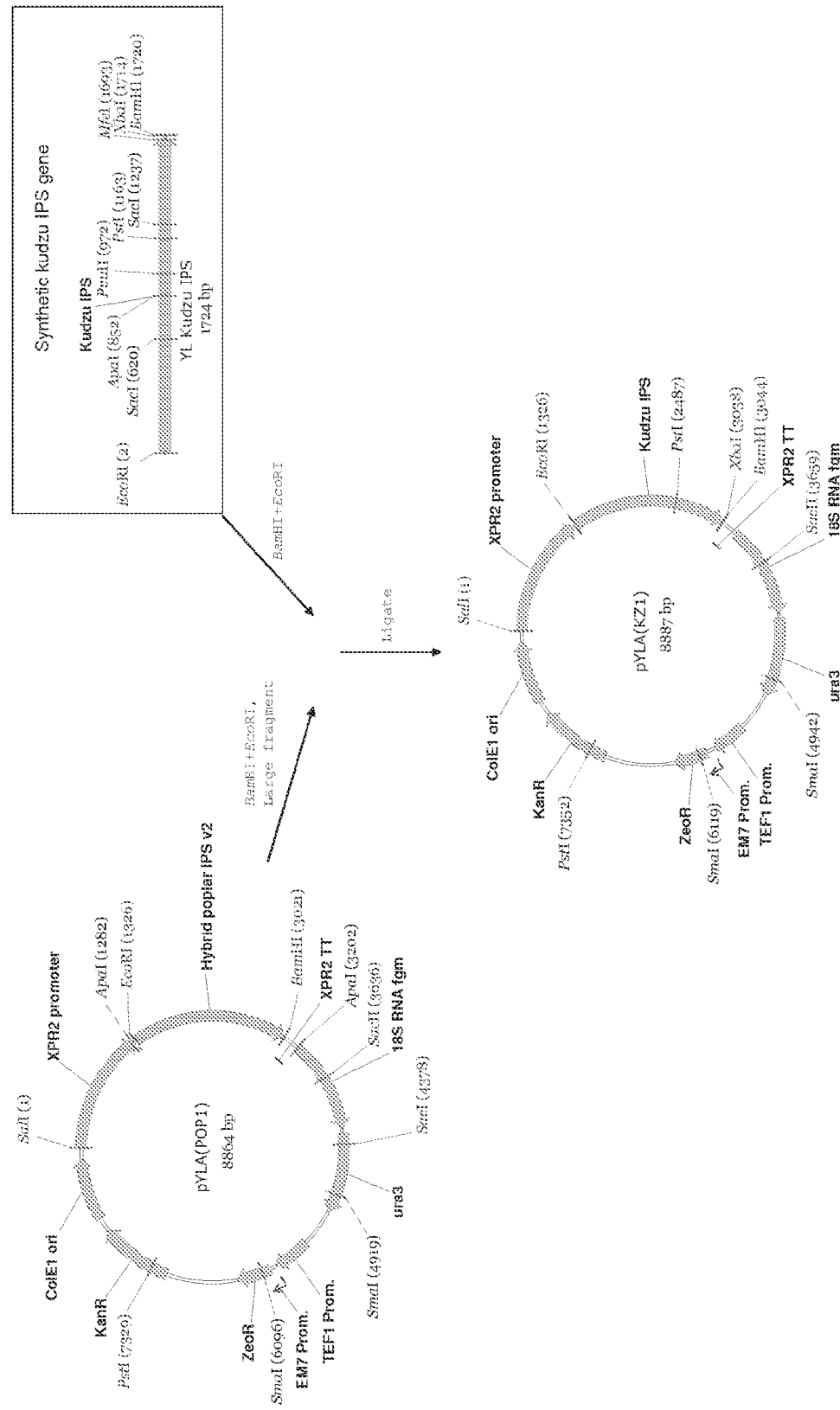


Figure 18D

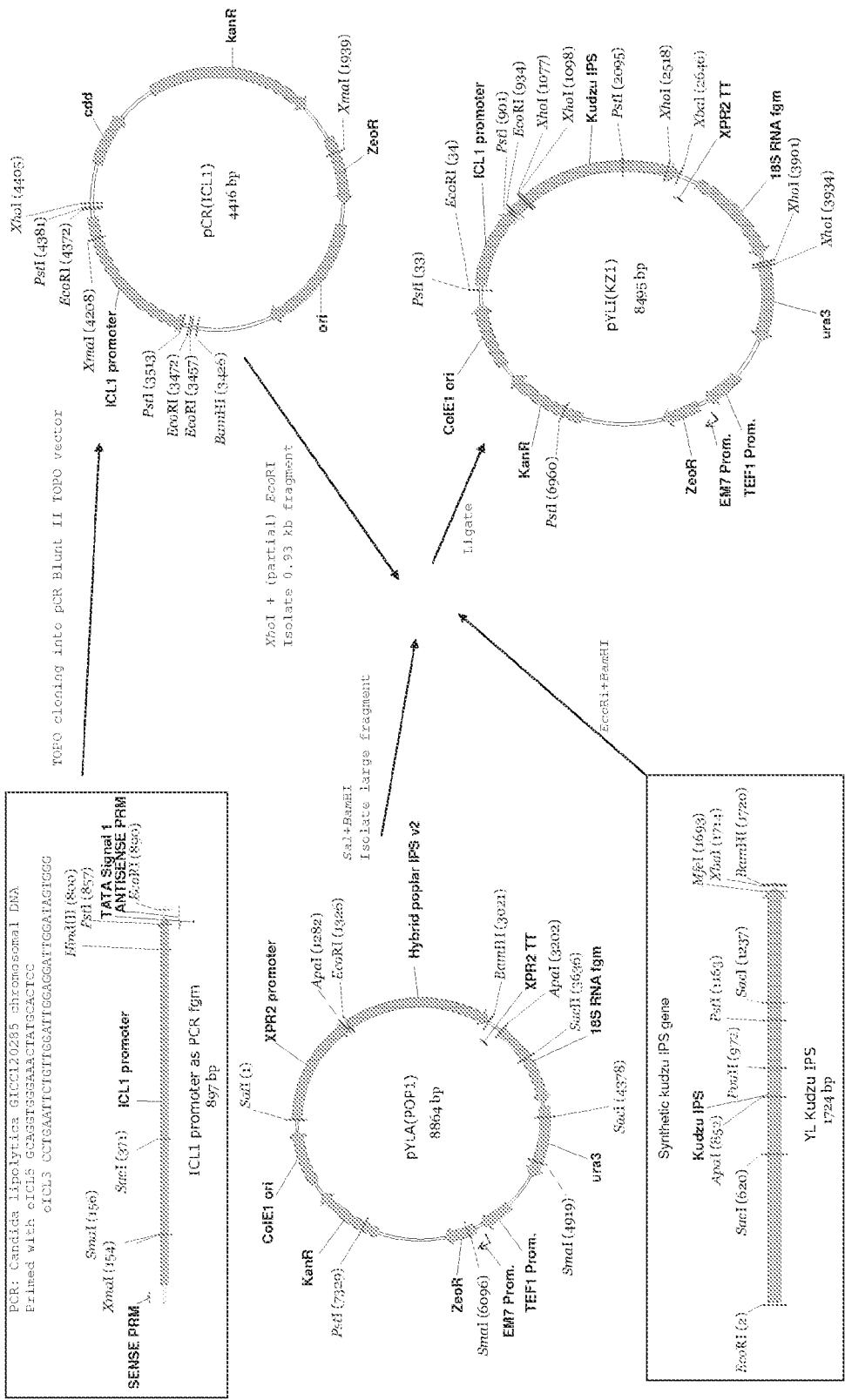


Figure 18E

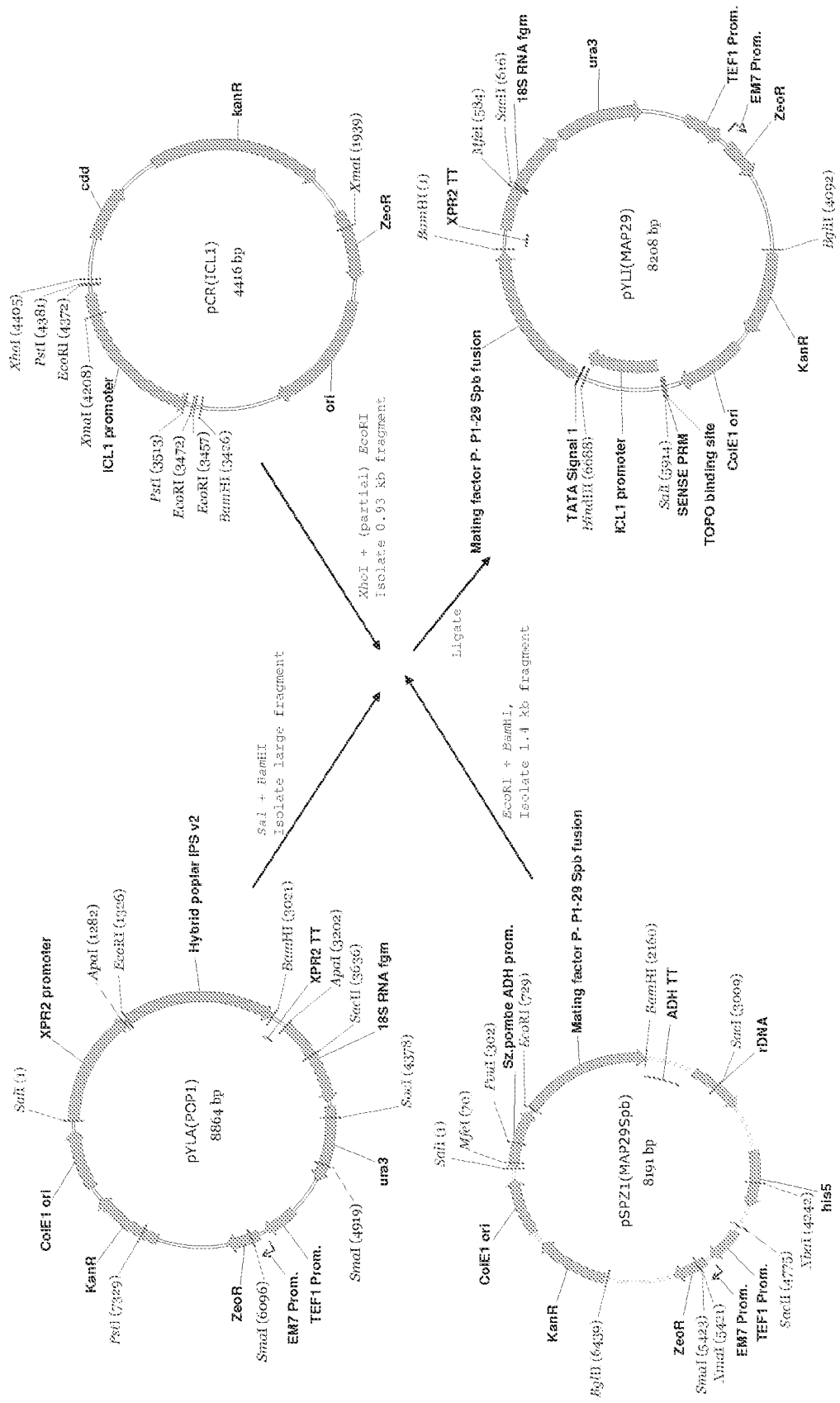


Figure 18.4

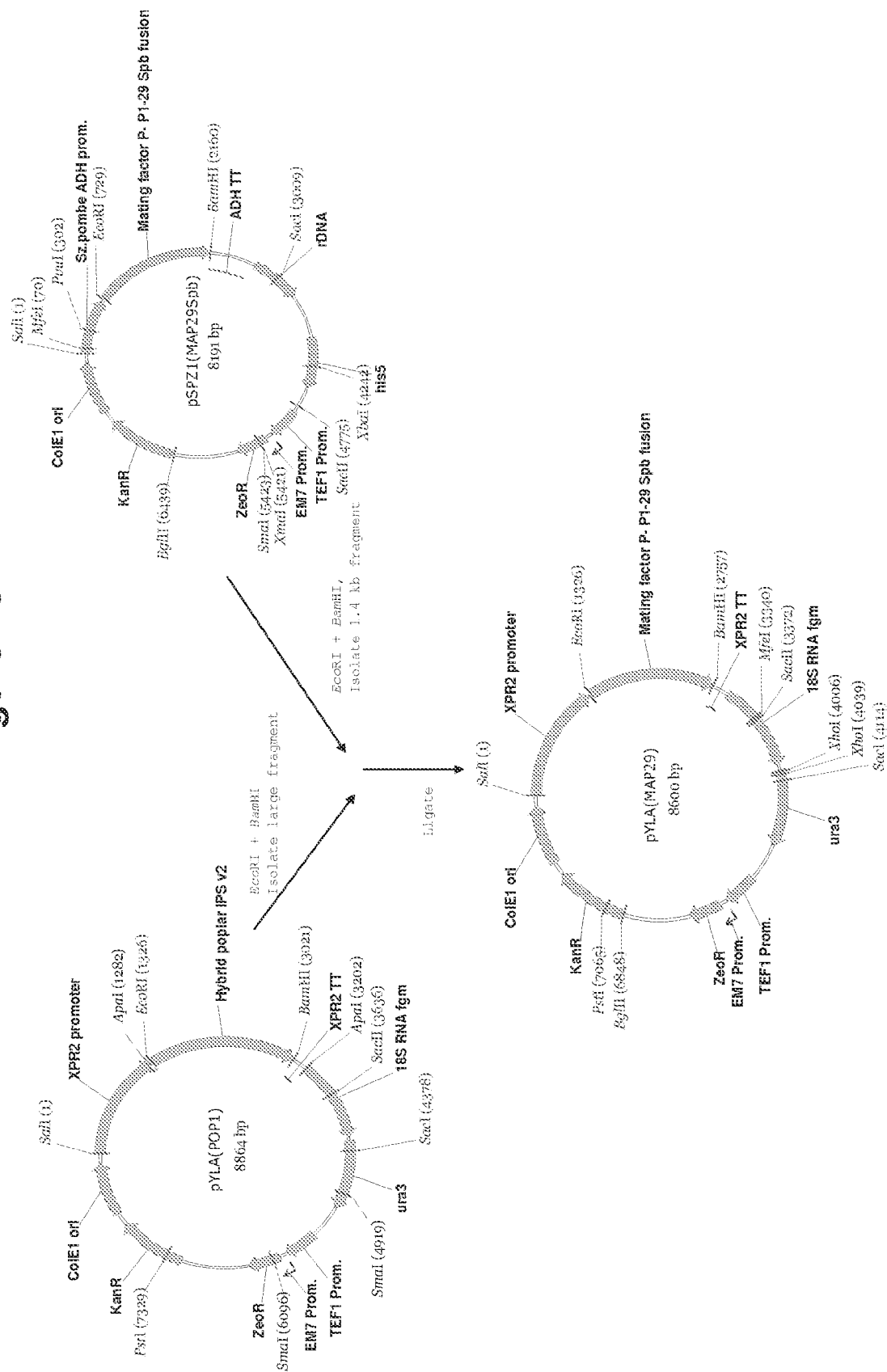


Figure 19A

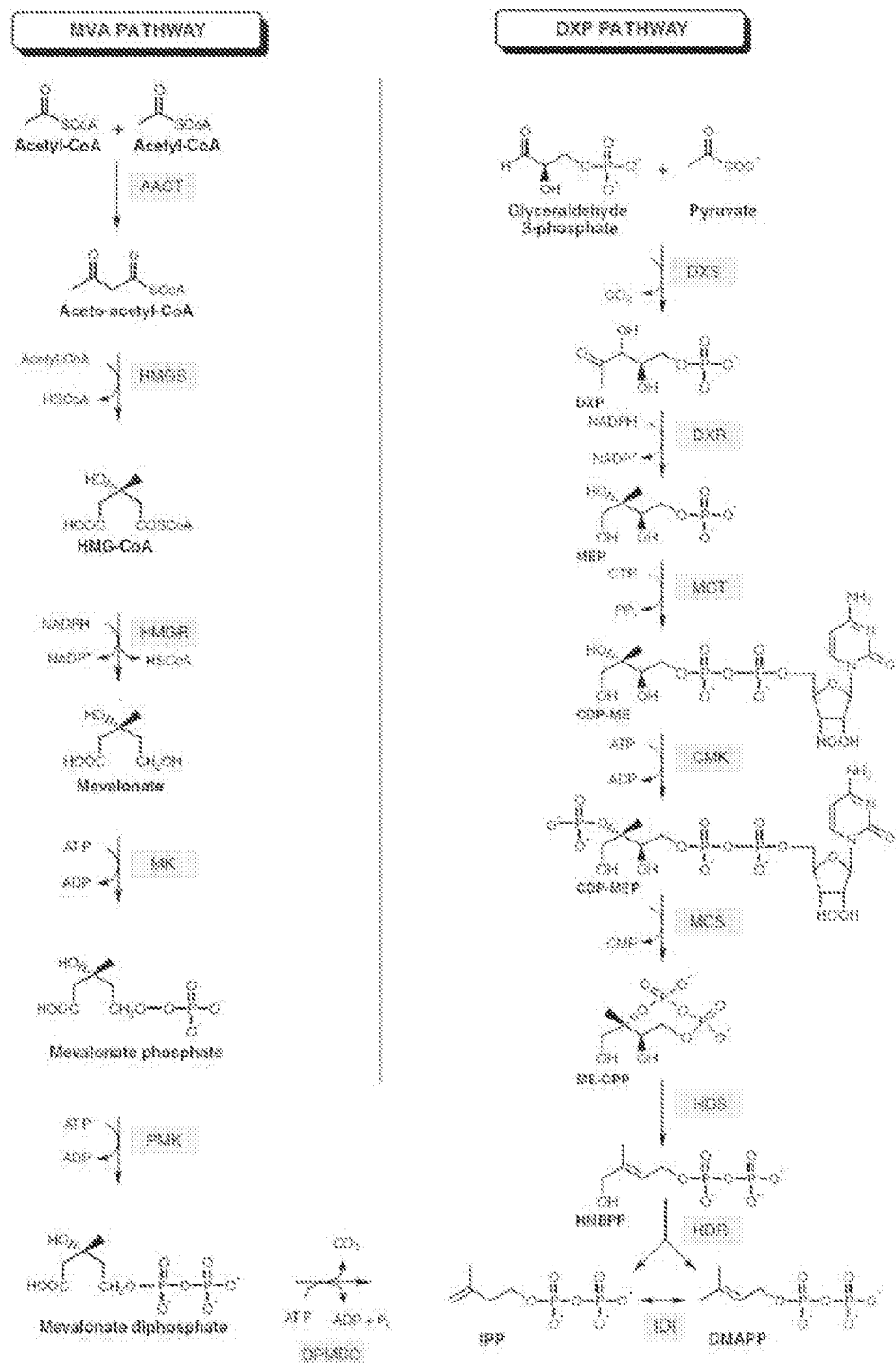


Figure 19B

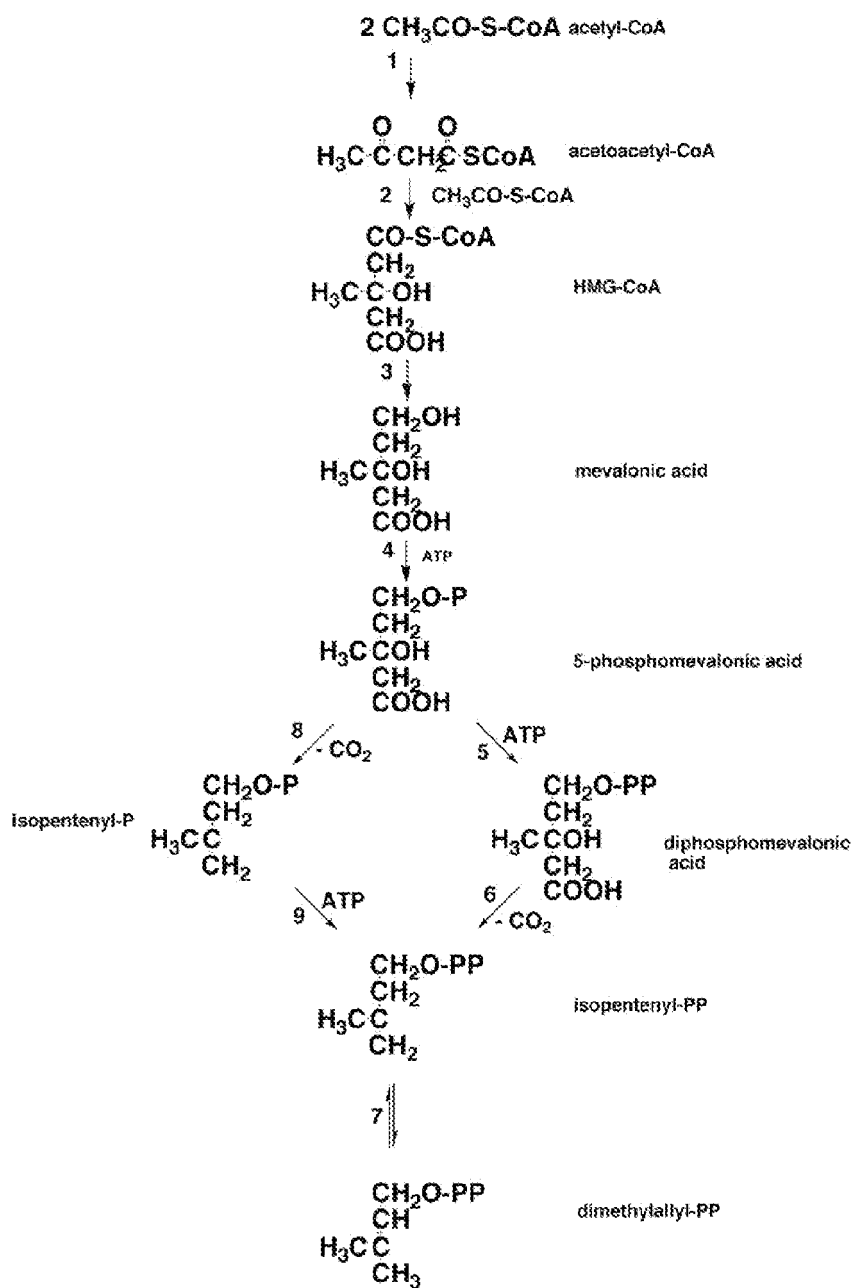


Figure 20

Y. lipolytica CLIB122:: pYL(MAP29) *Y. lipolytica* CLIB122:: pYL(KZ1)

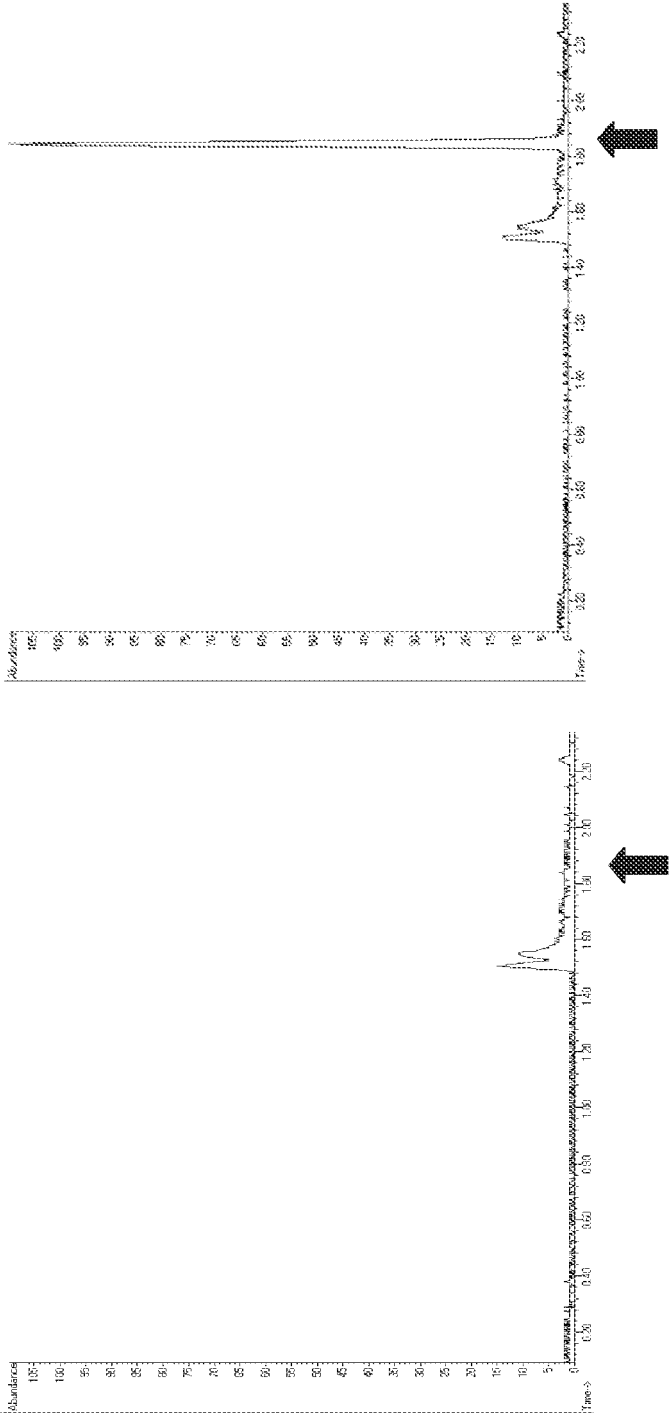


Figure 21

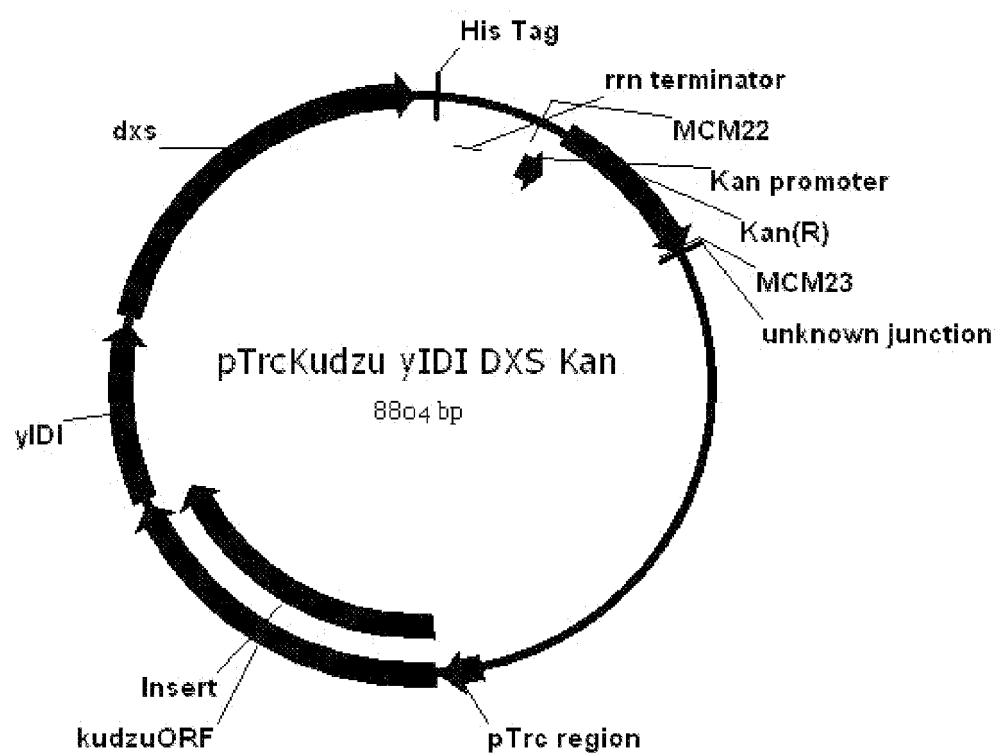


Figure 22A

1-

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Figure 22B

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Figure 22C

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Figure 22D

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Figure 23A

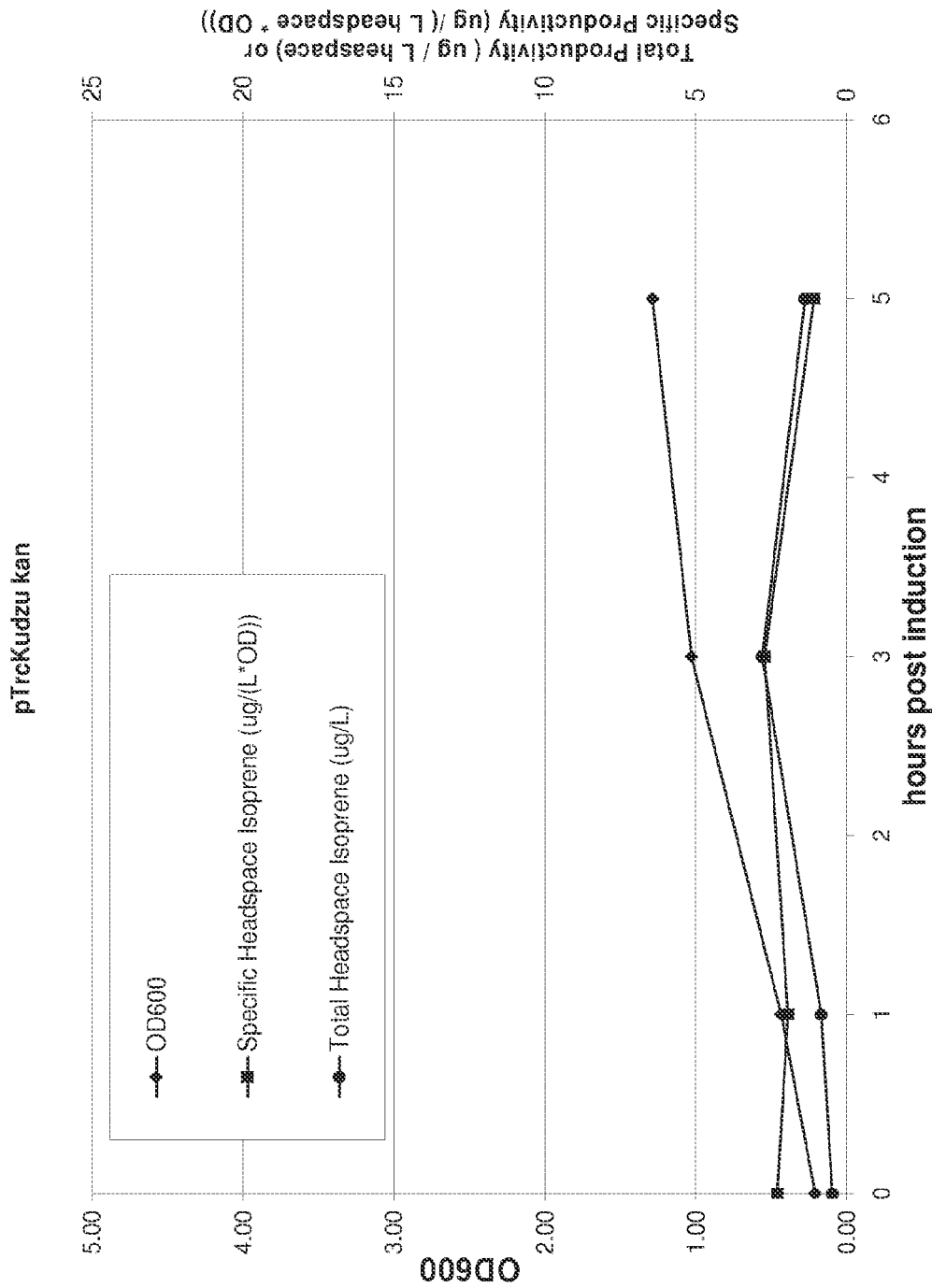


Figure 23B

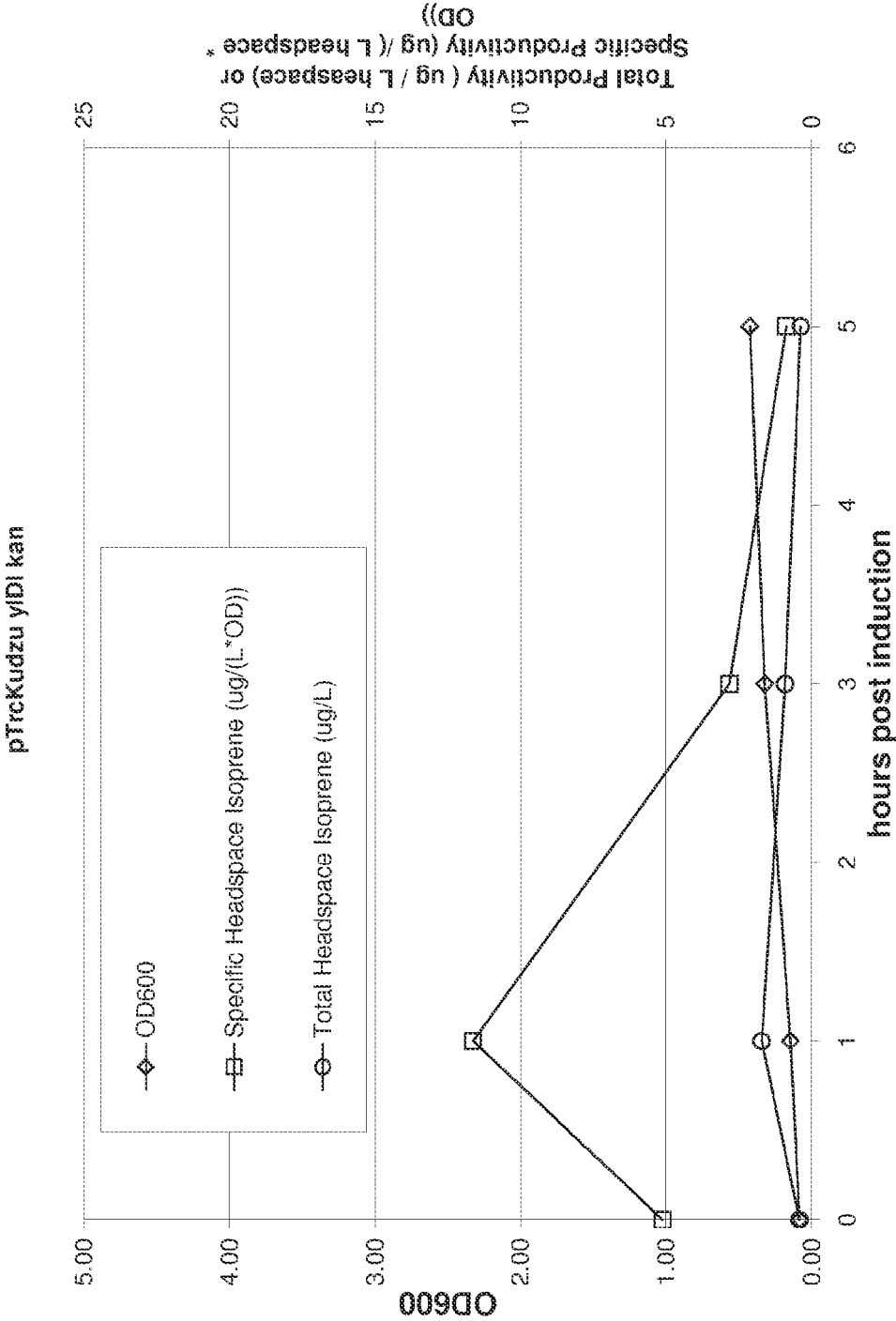


Figure 23C

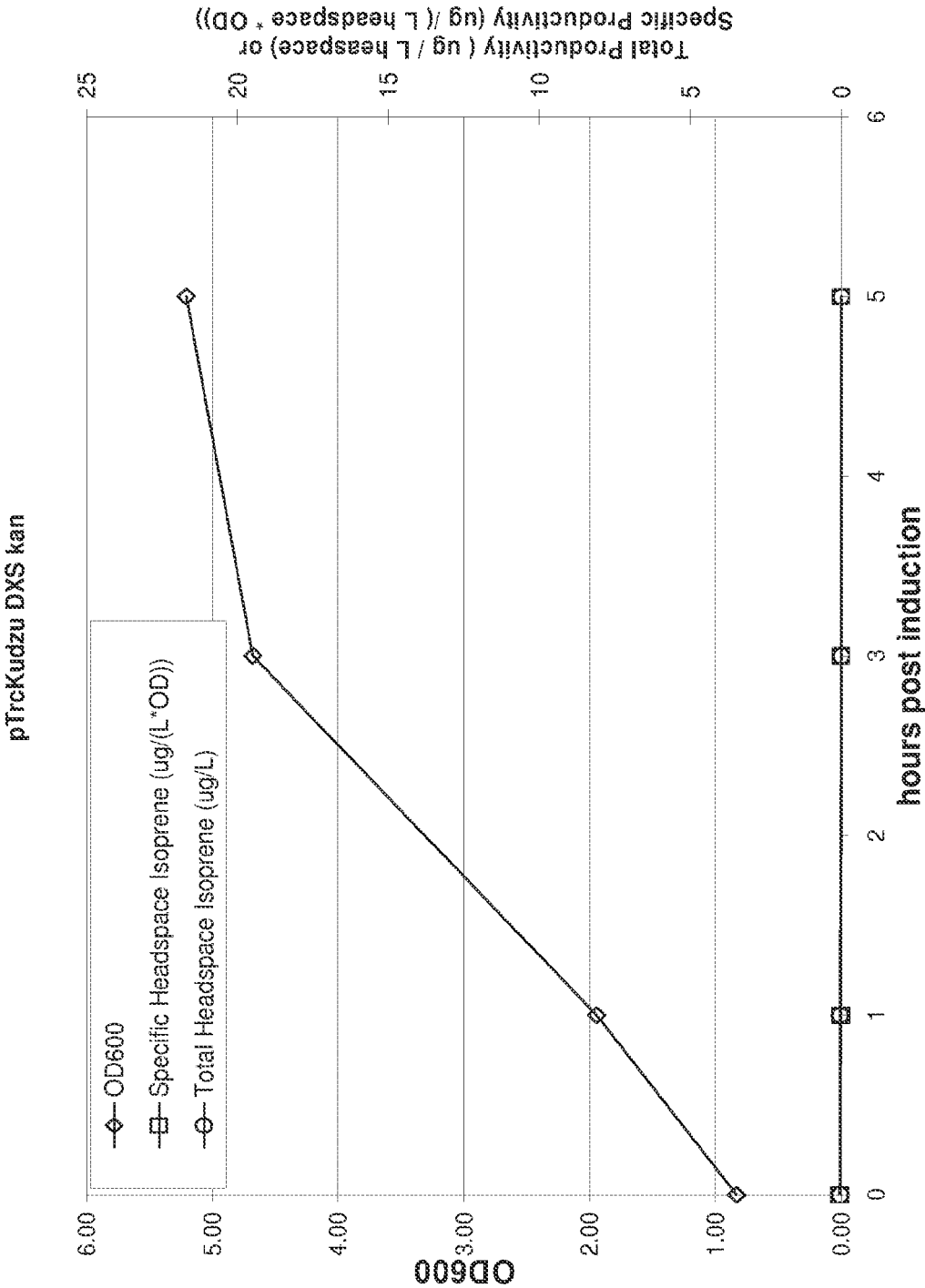


Figure 23D

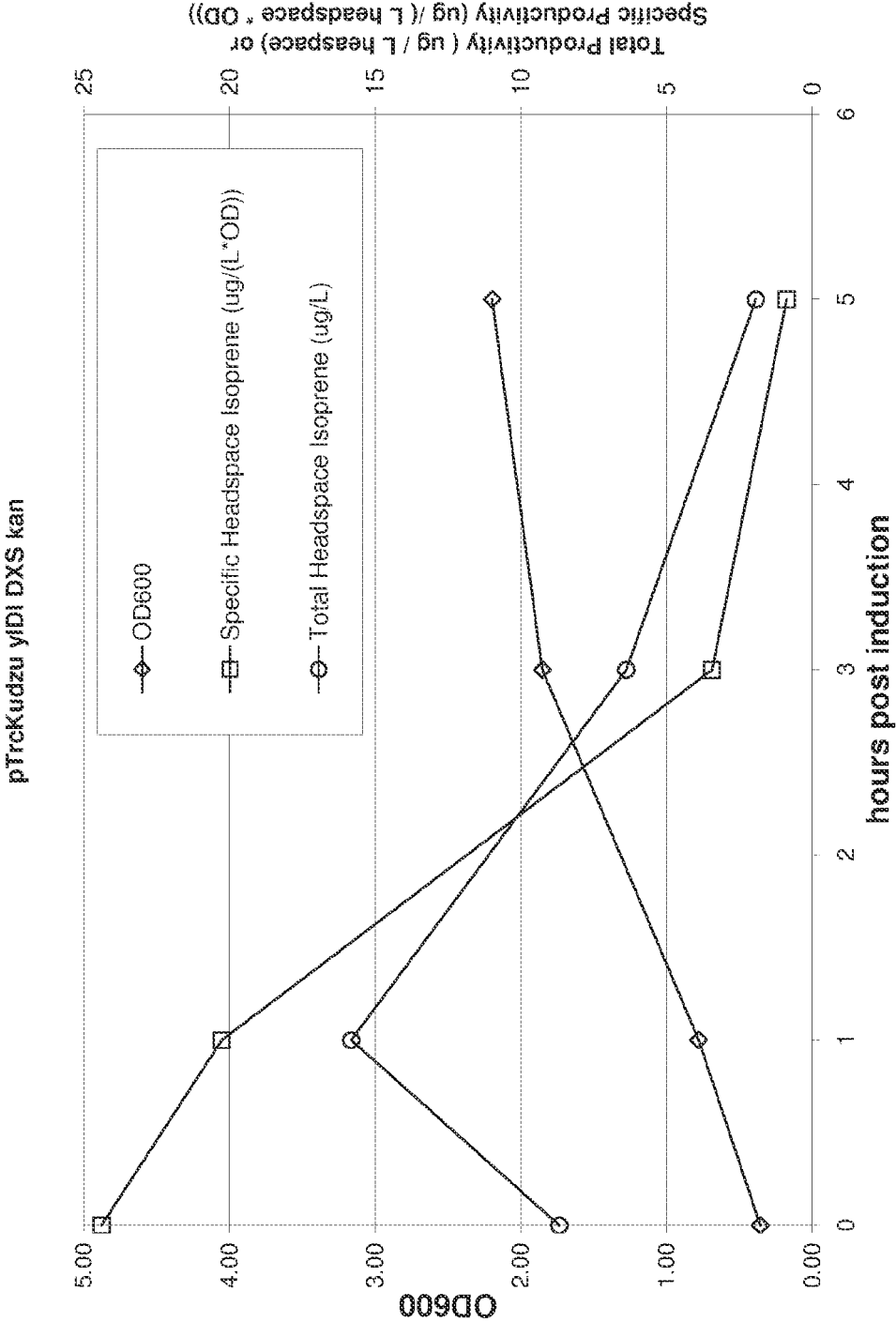


Figure 23E

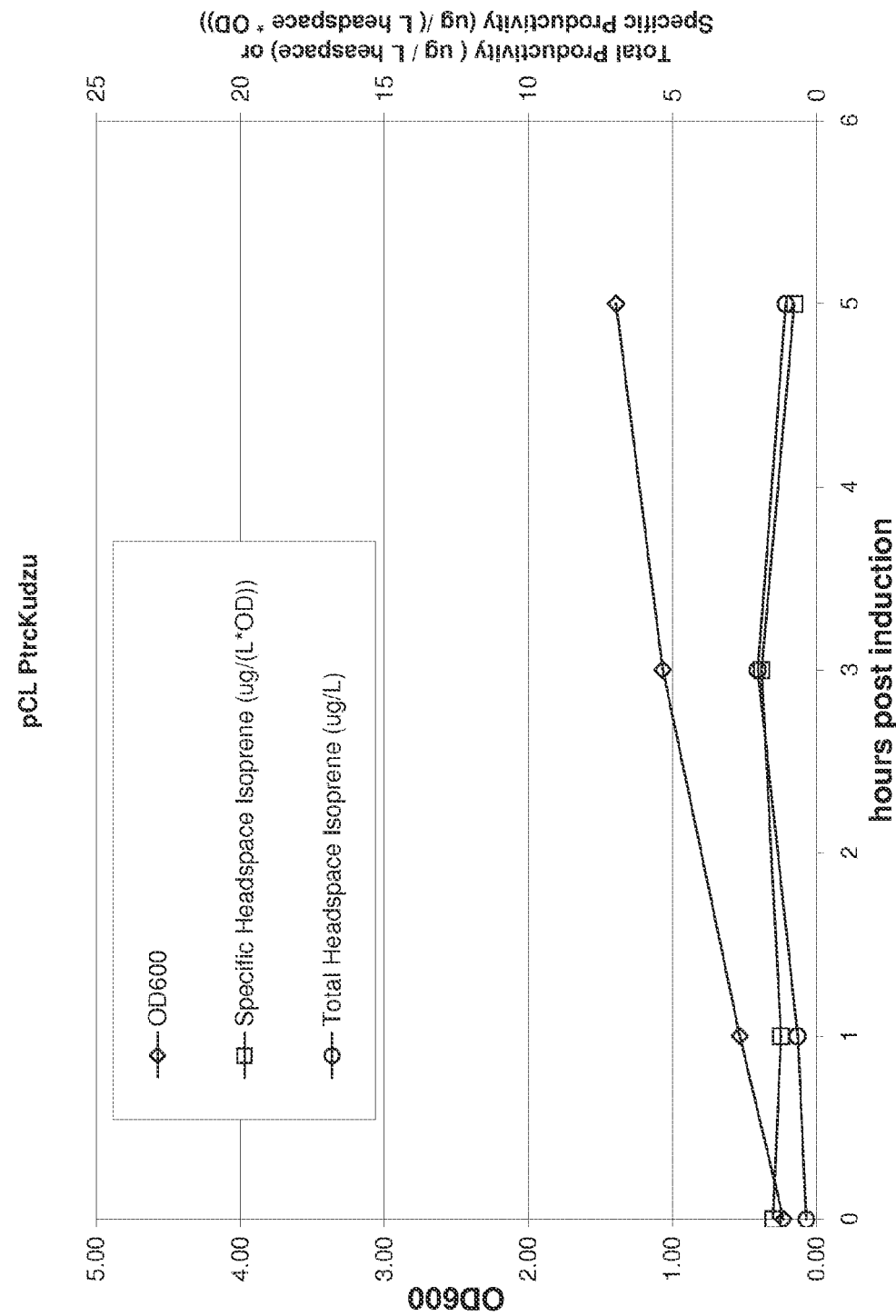


Figure 23F

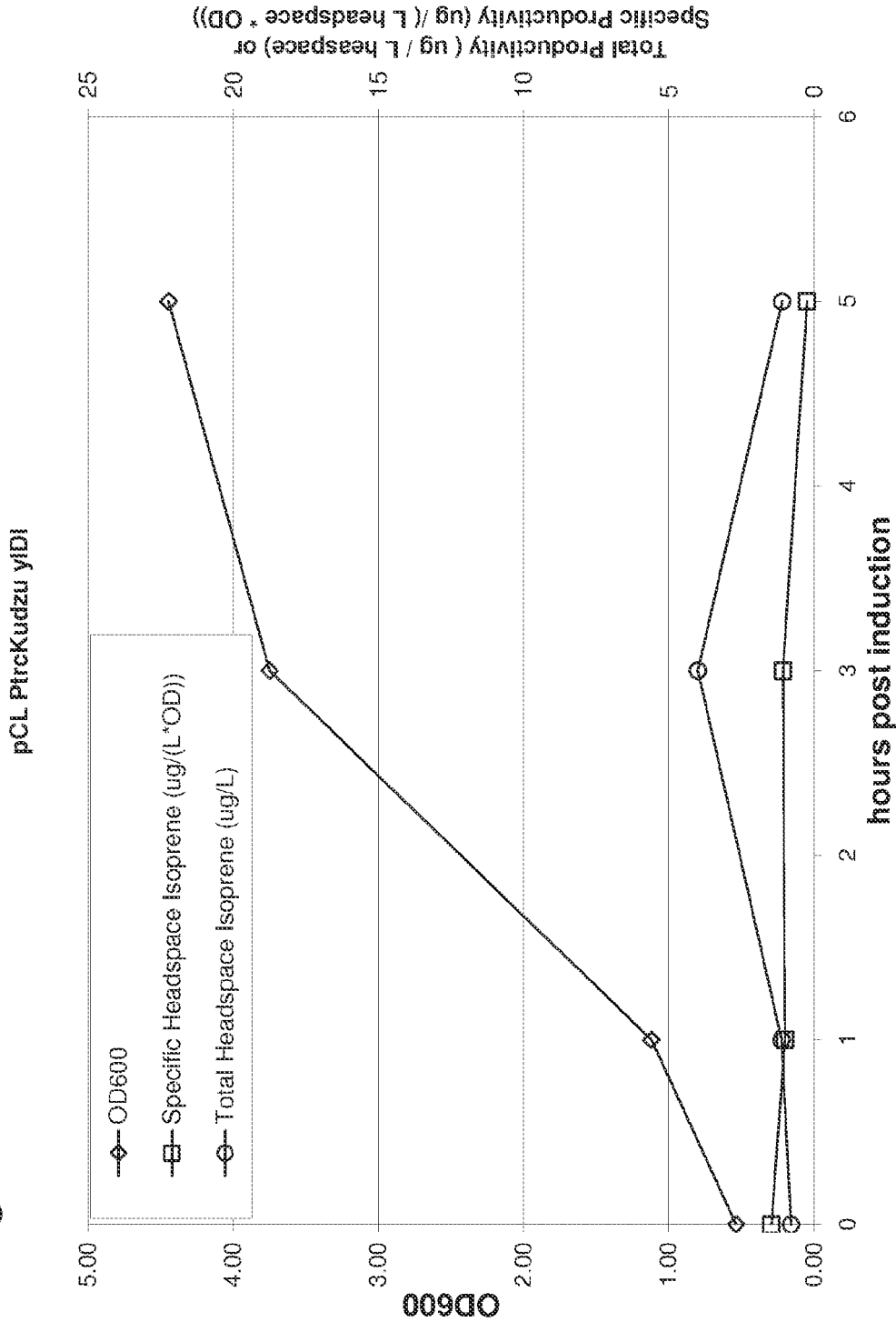
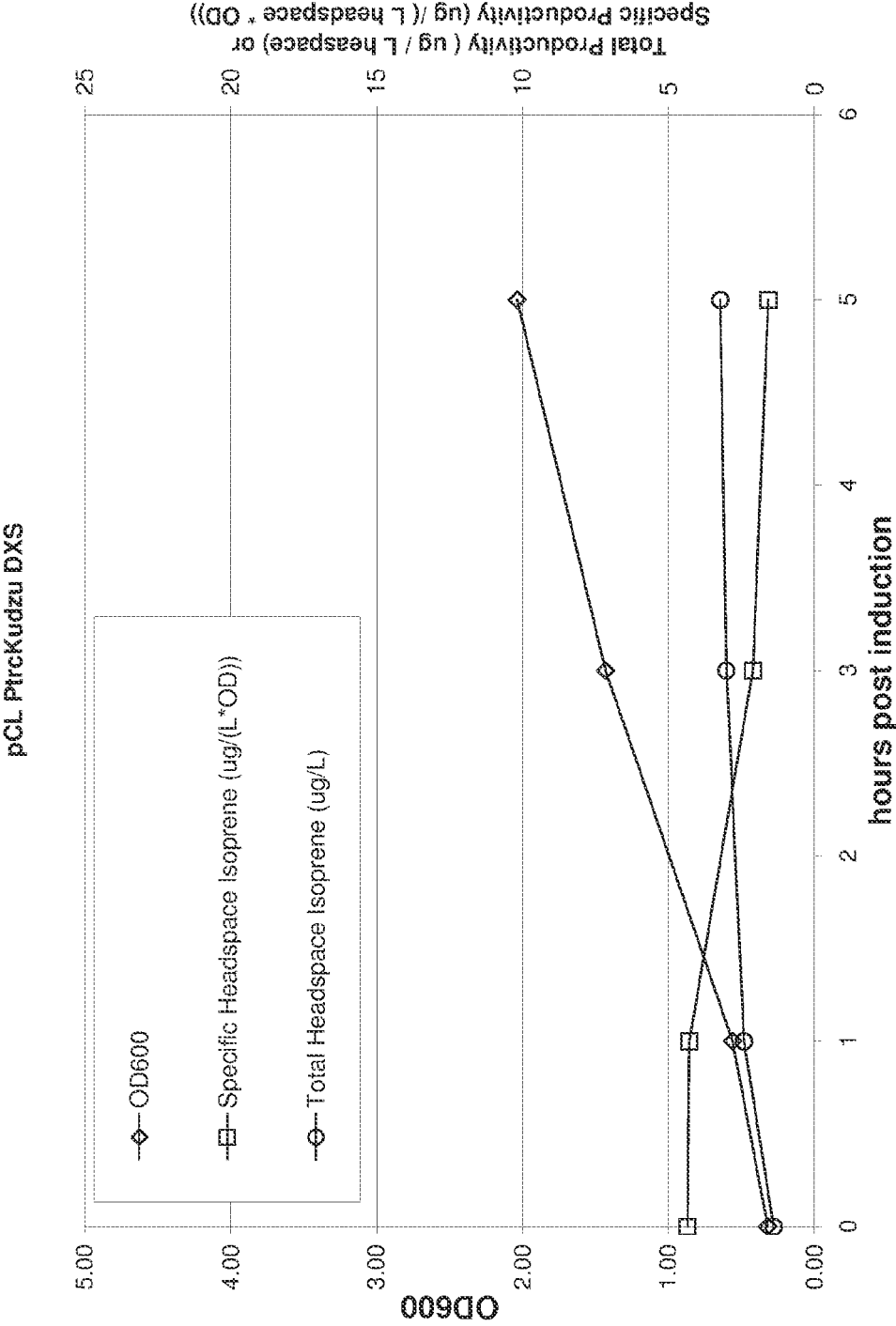


Figure 23G



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Figure 23H

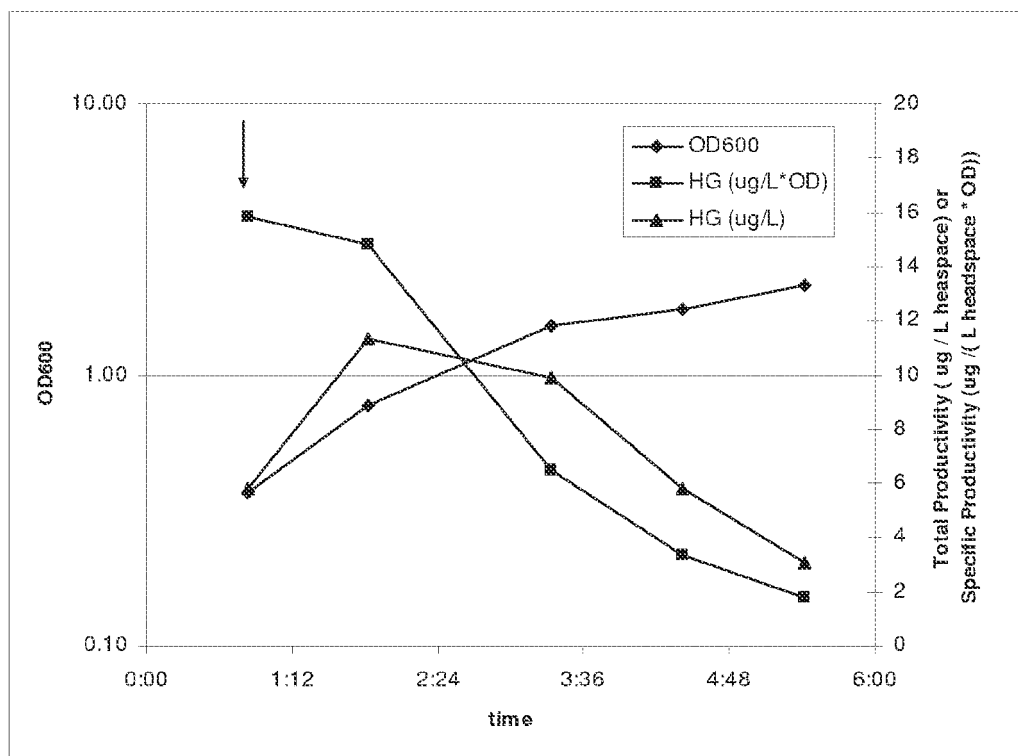


Figure 24

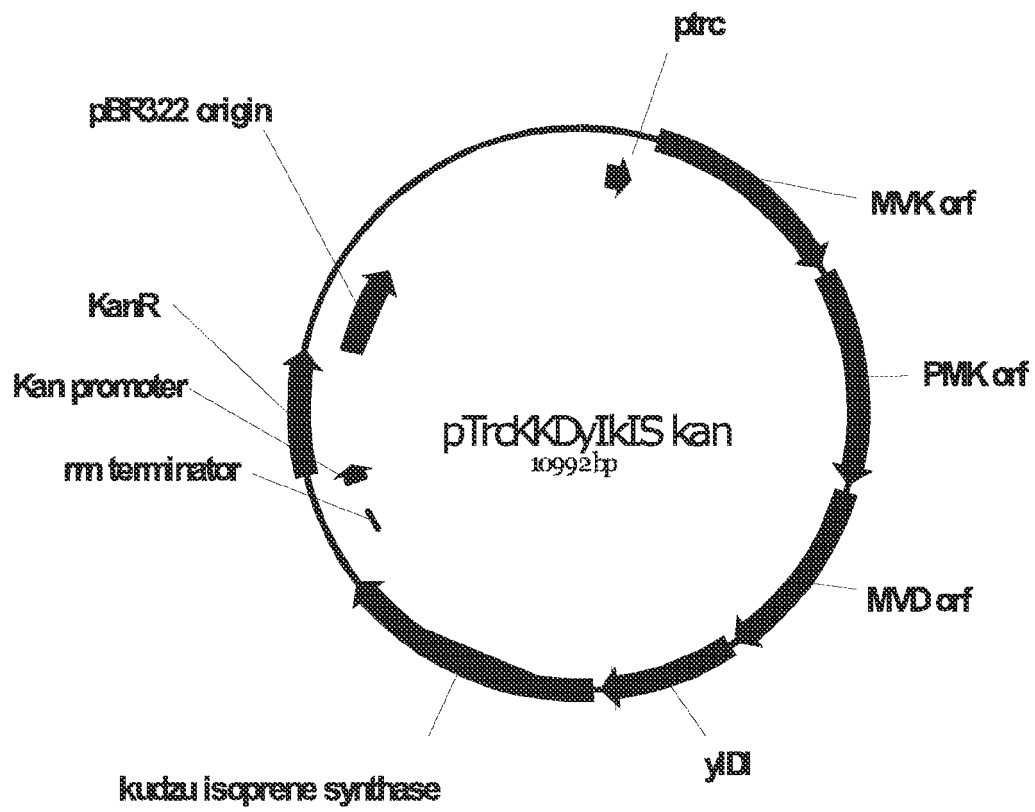


Figure 25A

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Figure 25B

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Figure 25C

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Figure 25D

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Figure 26

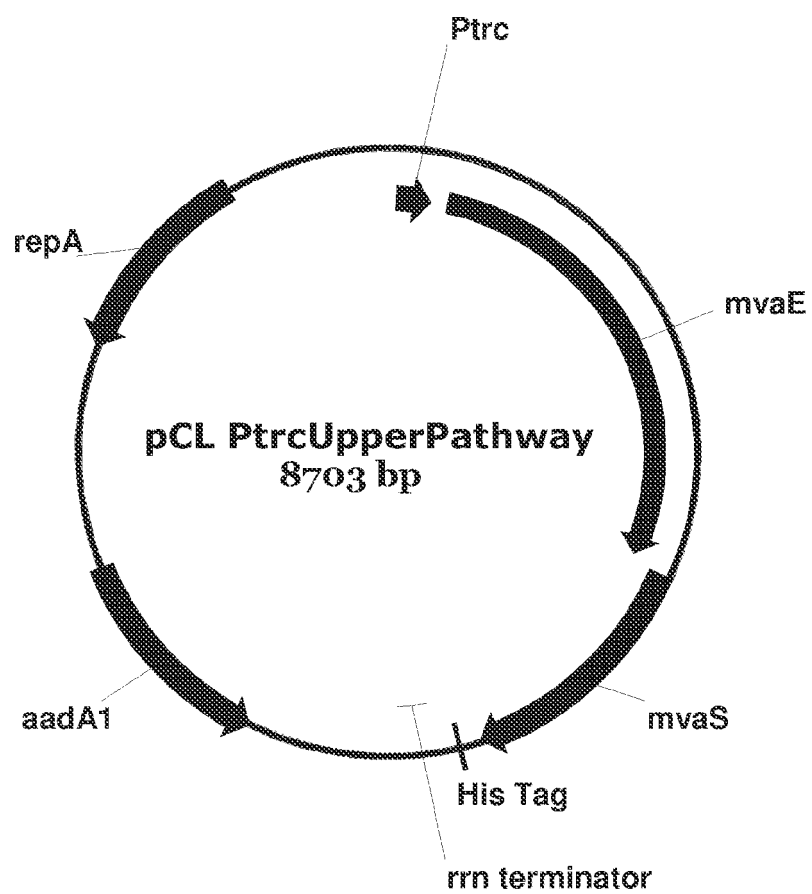


Figure 27A

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Figure 27B

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Figure 27C

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Figure 27D

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Figure 28

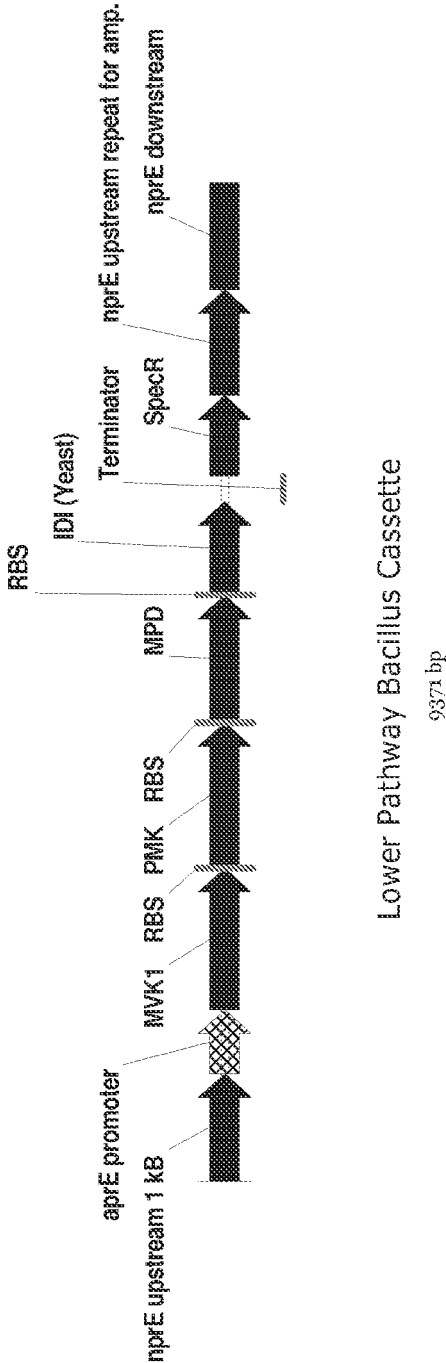


Figure 29A

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Figure 29B

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Figure 29C

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Figure 29D

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Figure 30

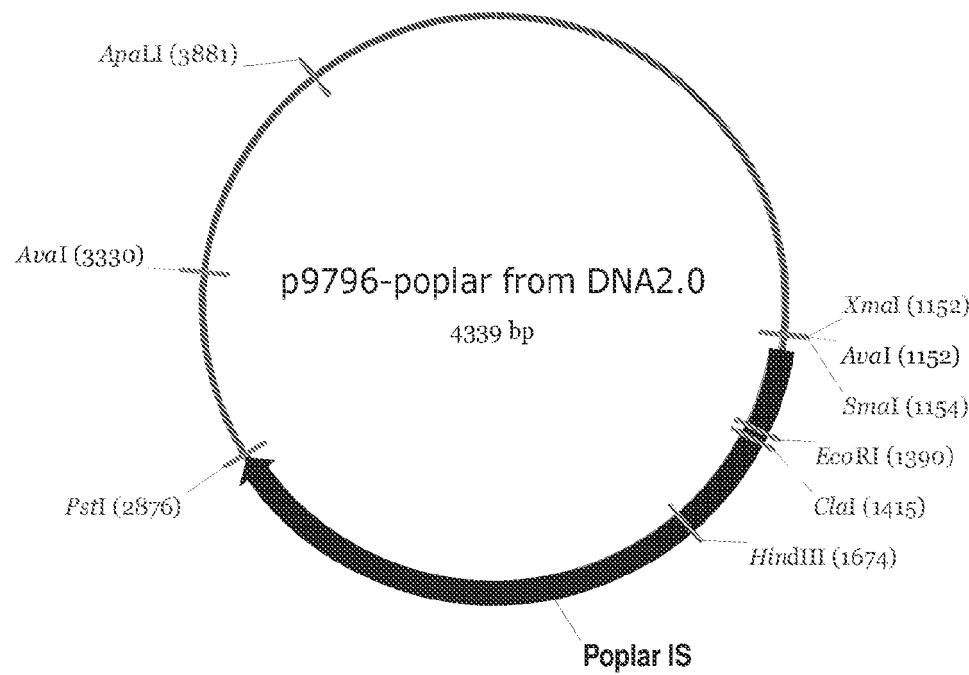


Figure 31A

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Figure 31B

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Figure 32

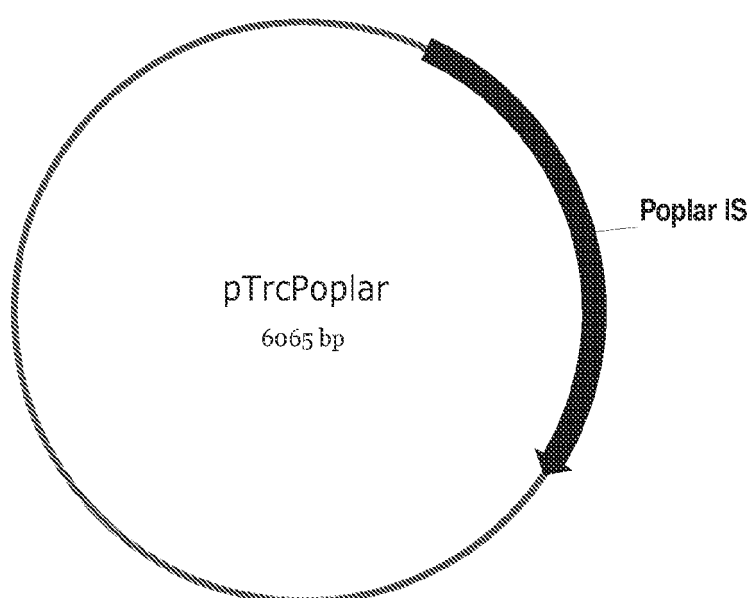


Figure 33A

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Figure 33B

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Figure 33C

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Figure 34

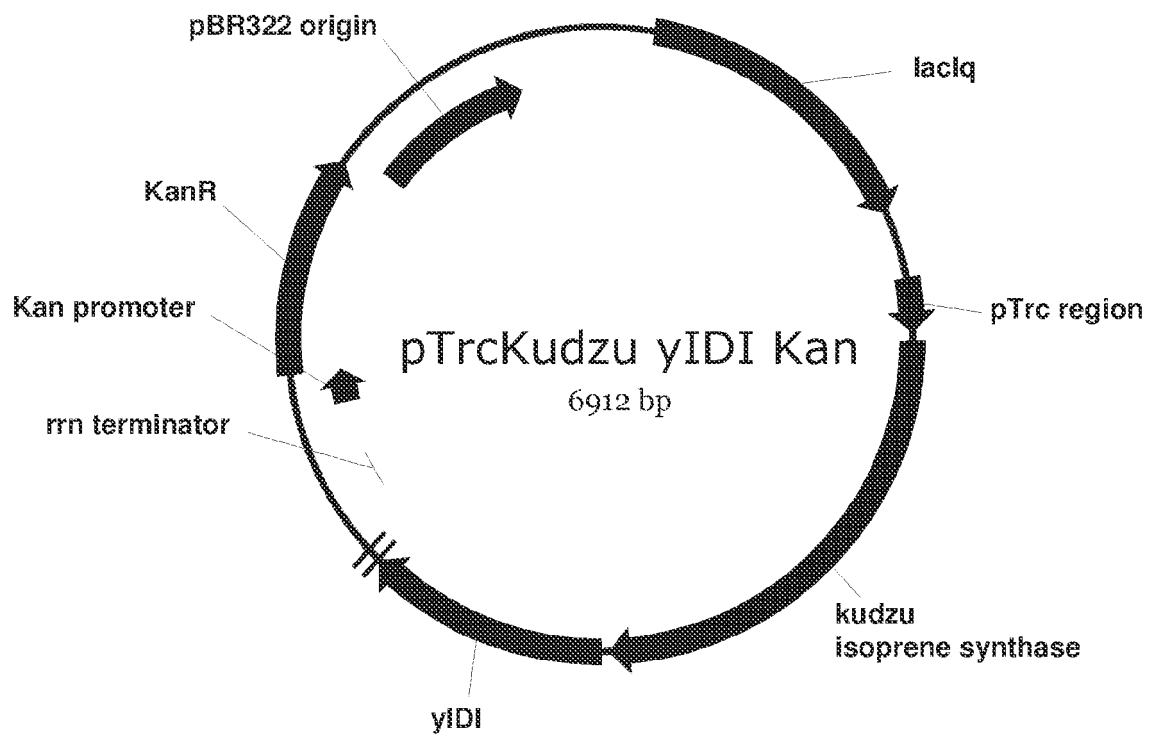


Figure 35A

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Figure 35B

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Figure 35C

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Figure 36

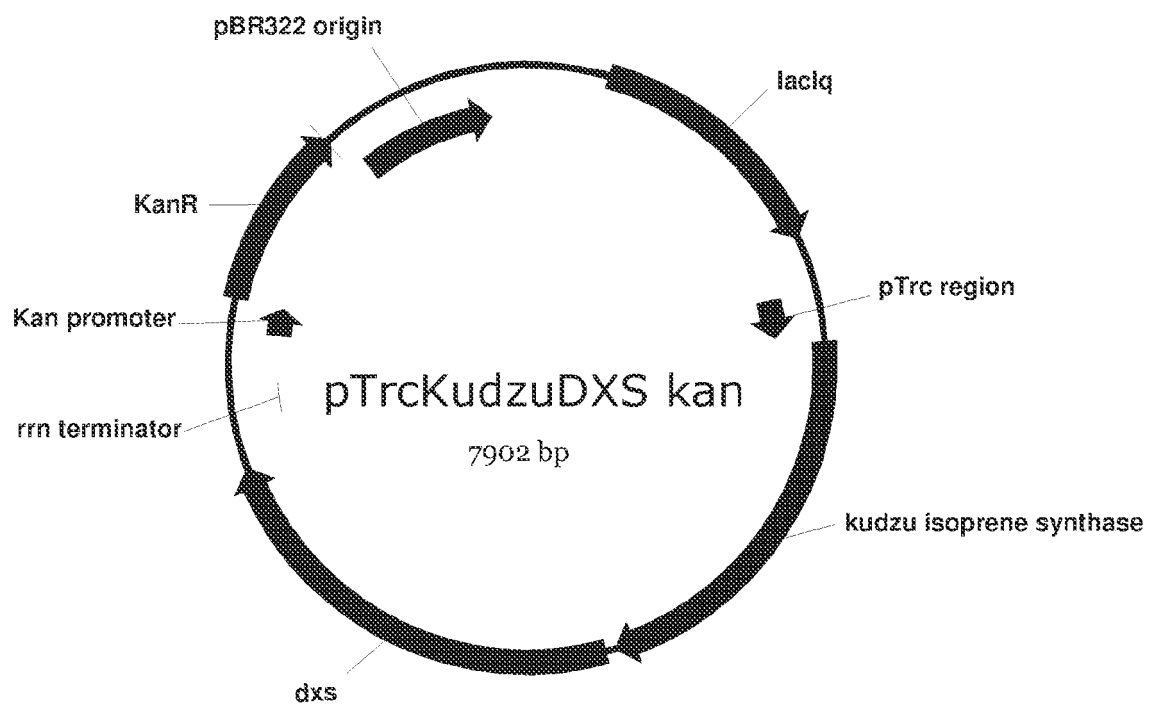


Figure 37A

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Figure 37B

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Figure 37C

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Figure 38

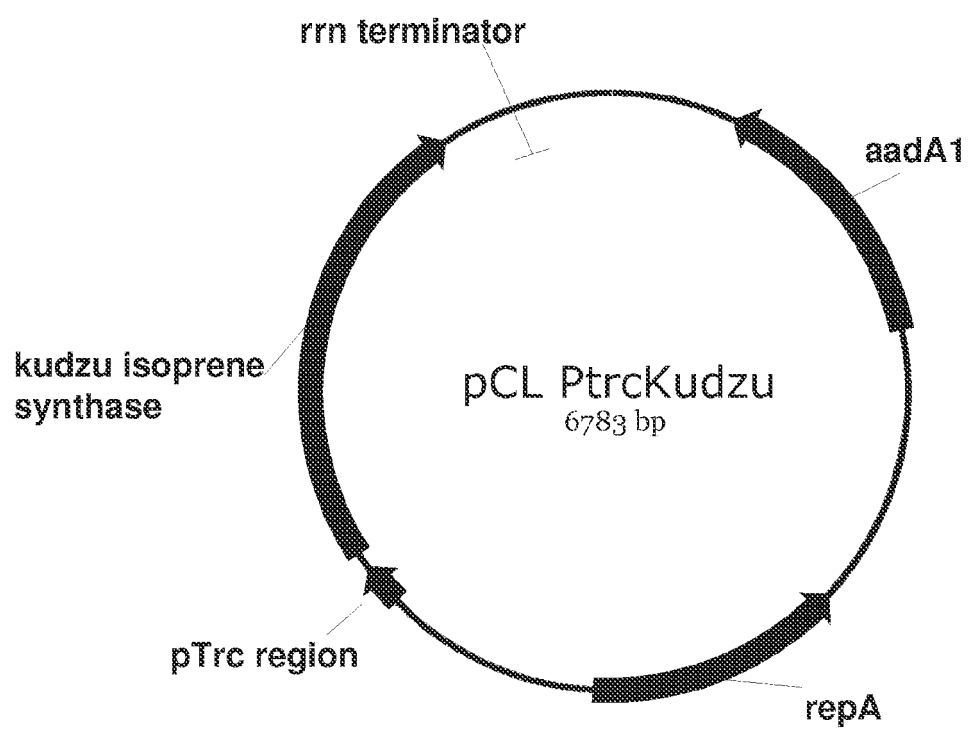


Figure 39A

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Figure 39B

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Figure 39C

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Figure 40

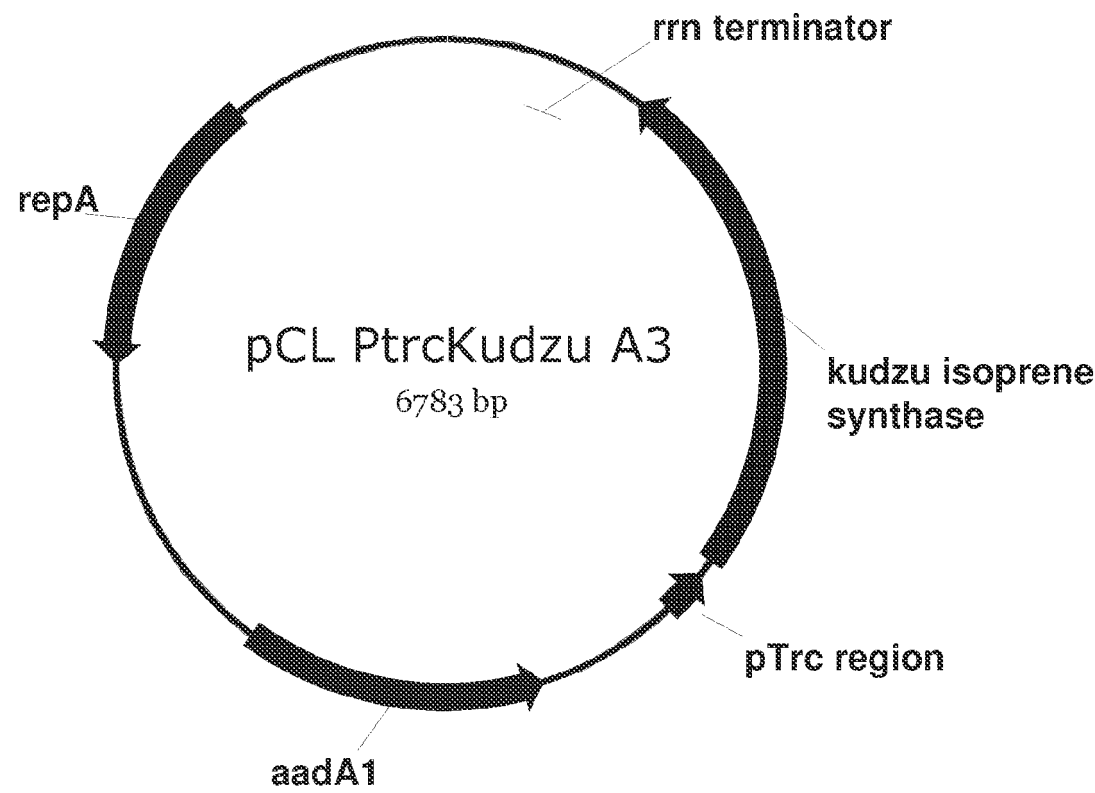


Figure 41A

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Figure 41B

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Figure 41C

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Figure 42

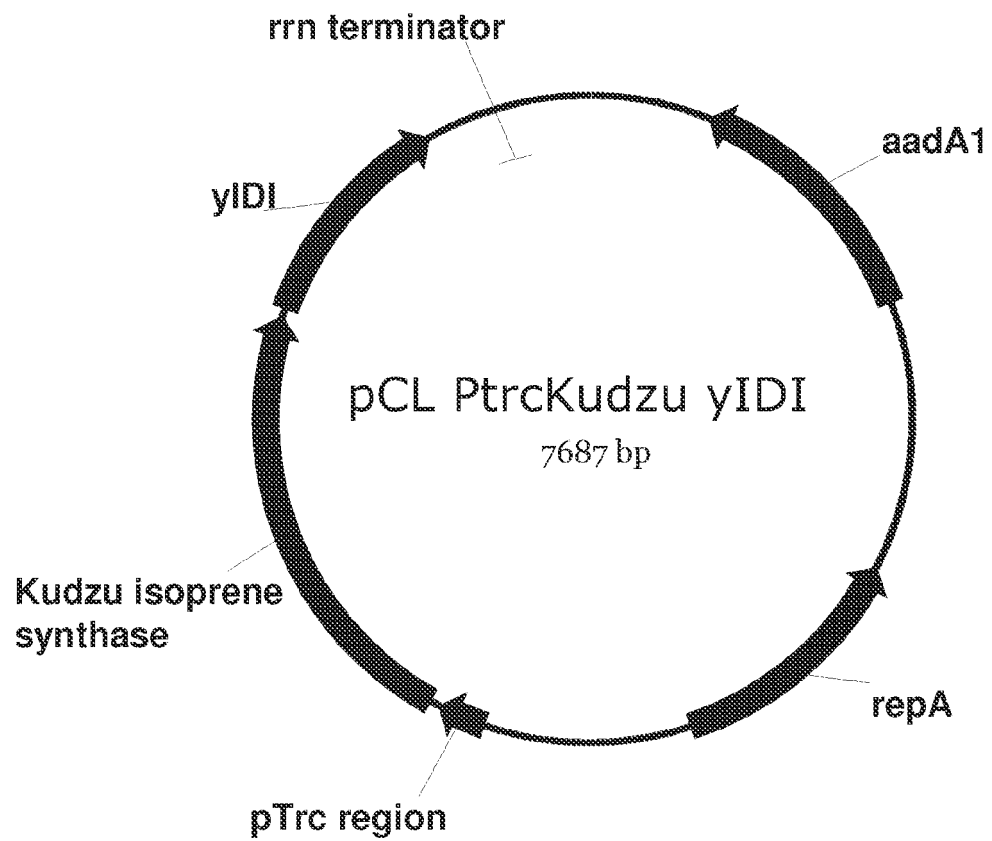


Figure 43A

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Figure 43B

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Figure 43C

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Figure 44

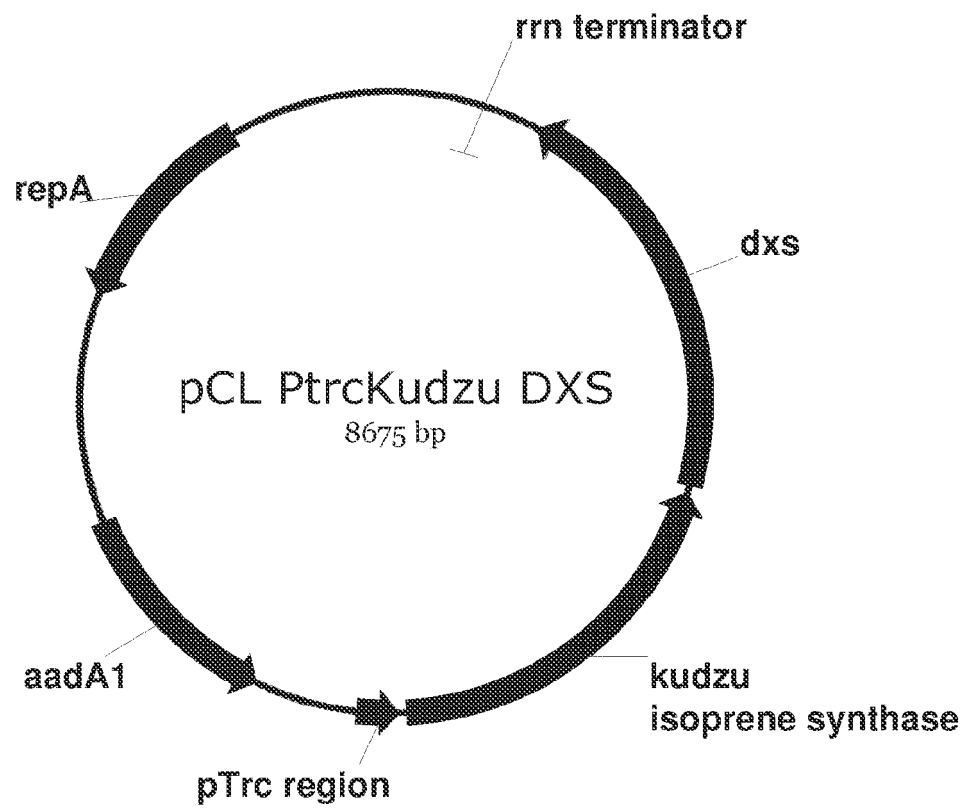


Figure 45A

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Figure 45B

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Figure 45C

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Figure 45D

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Figure 46A

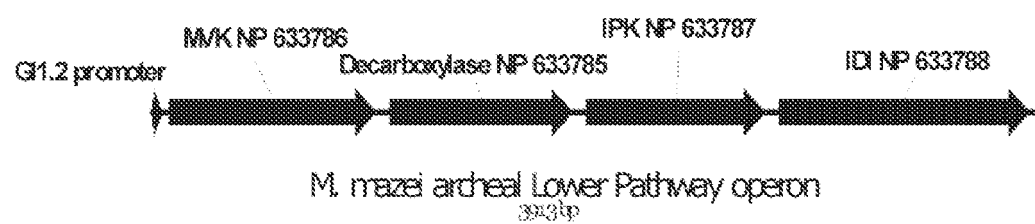


Figure 46B

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Figure 46C

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Figure 47A

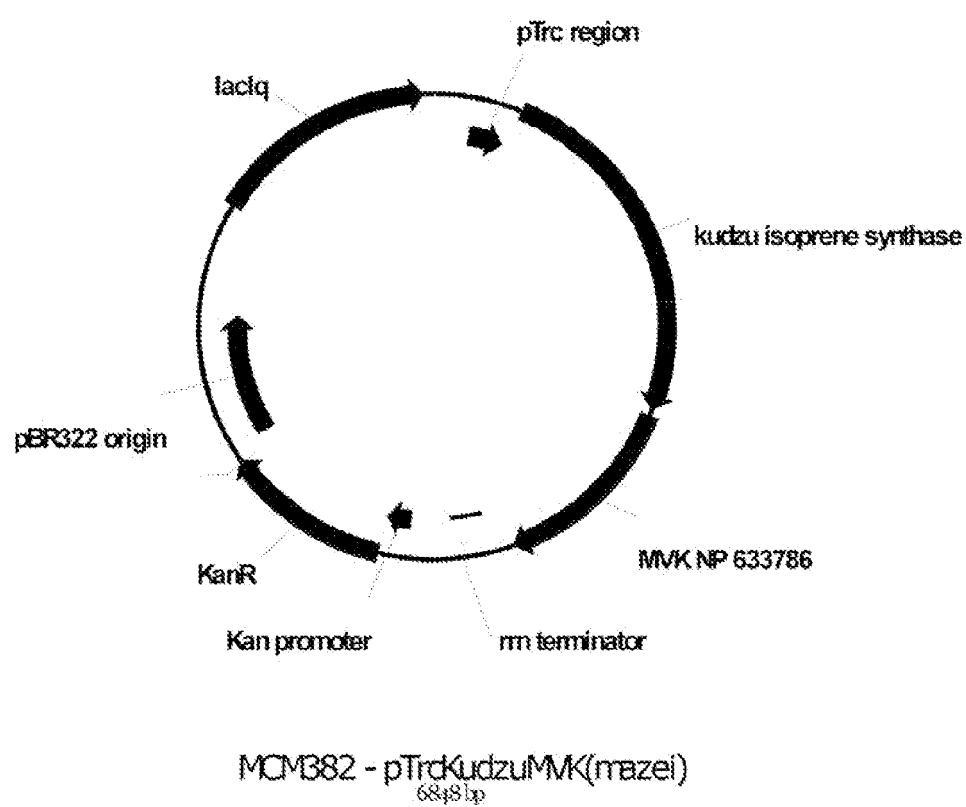


Figure 47B

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Figure 47C

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Figure 48A

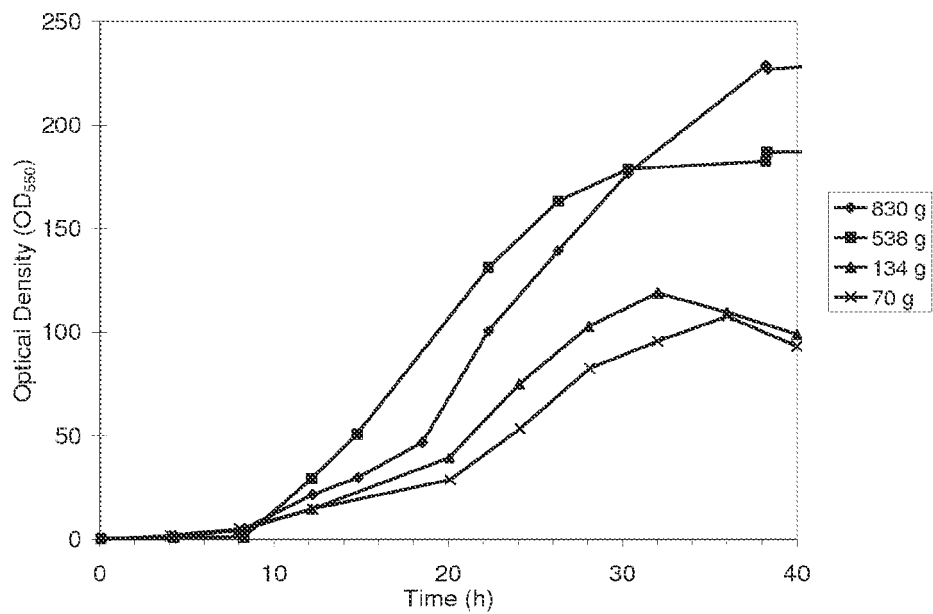
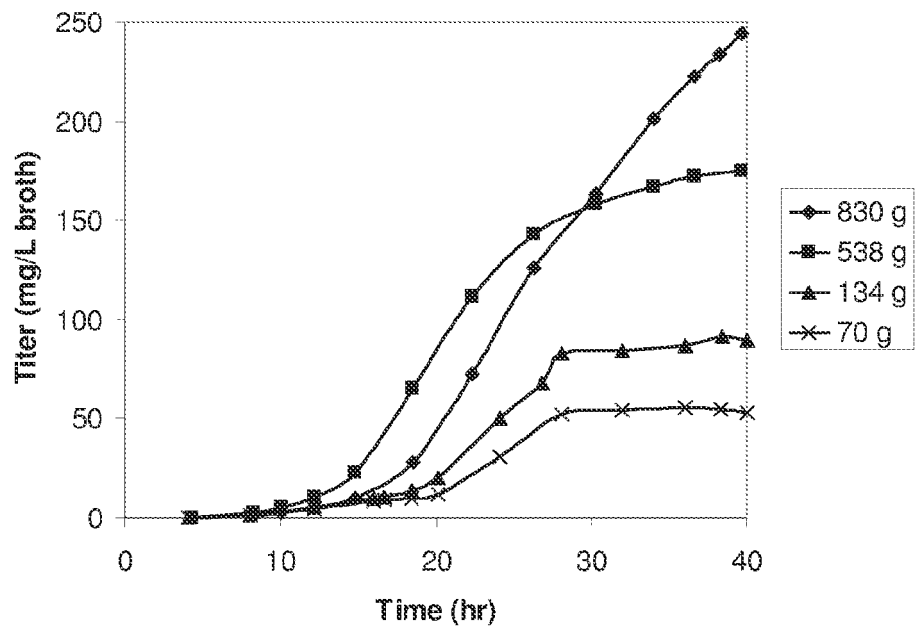
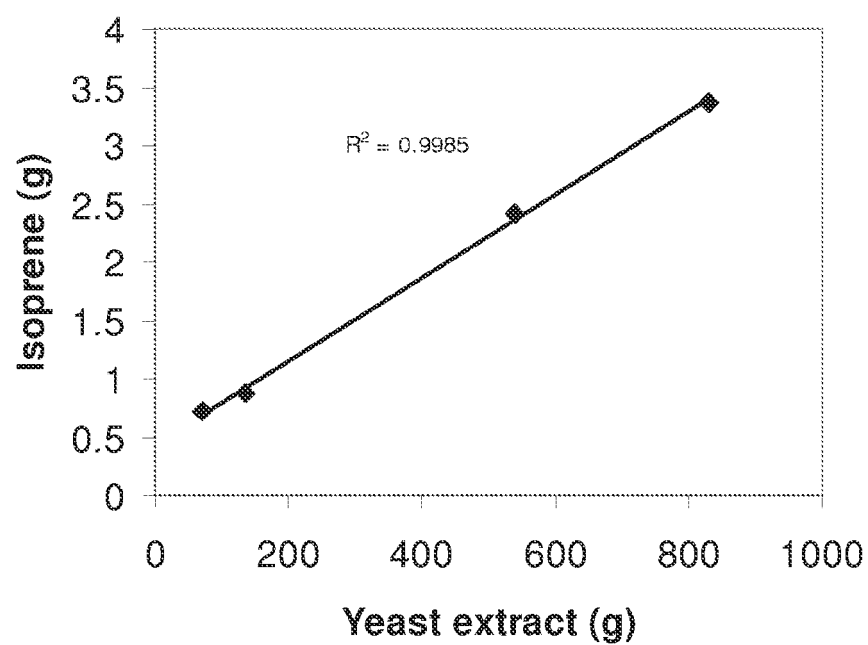


Figure 48B



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Figure 48C



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Figure 49A

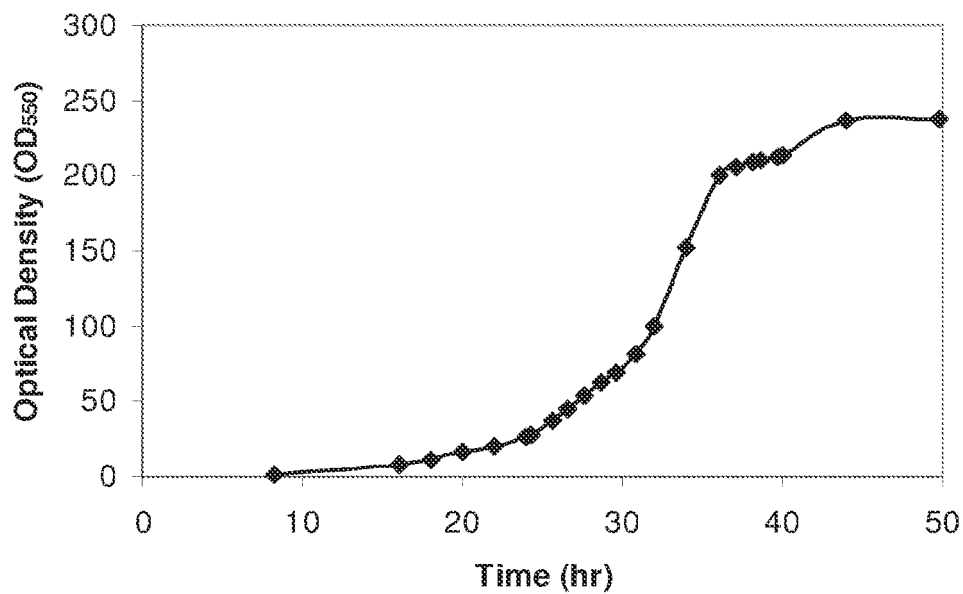
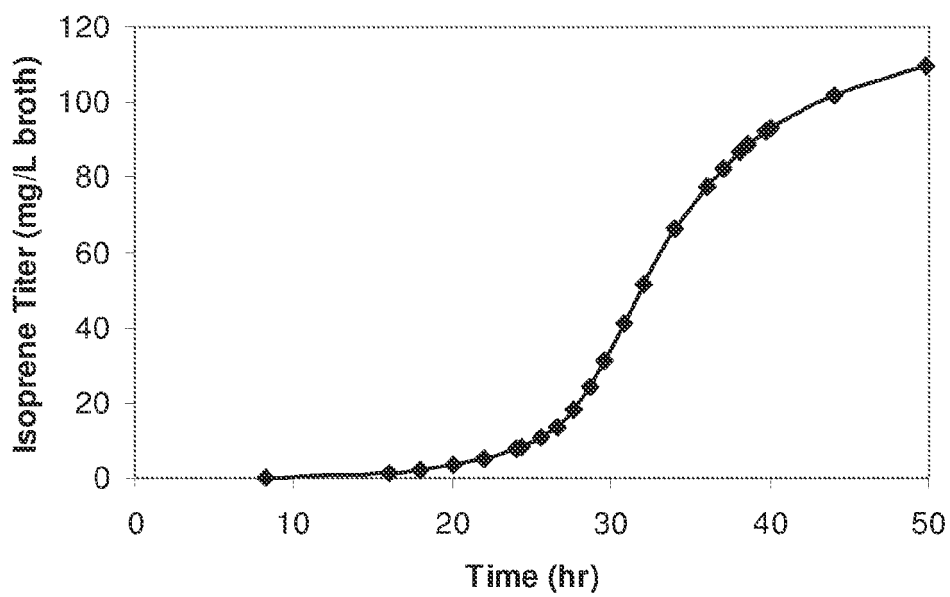


Figure 49B



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Figure 49C

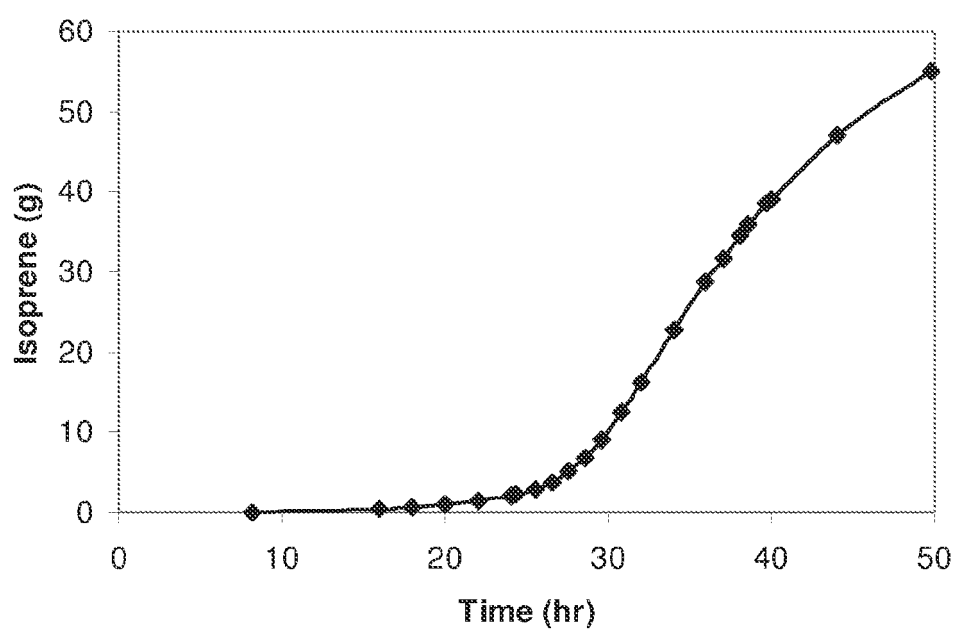


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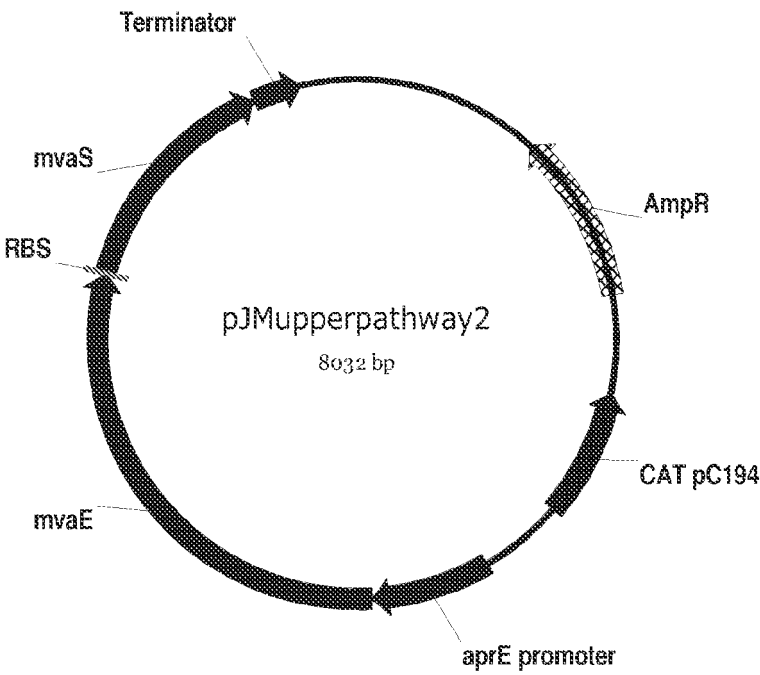


Figure 51A

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Figure 51B

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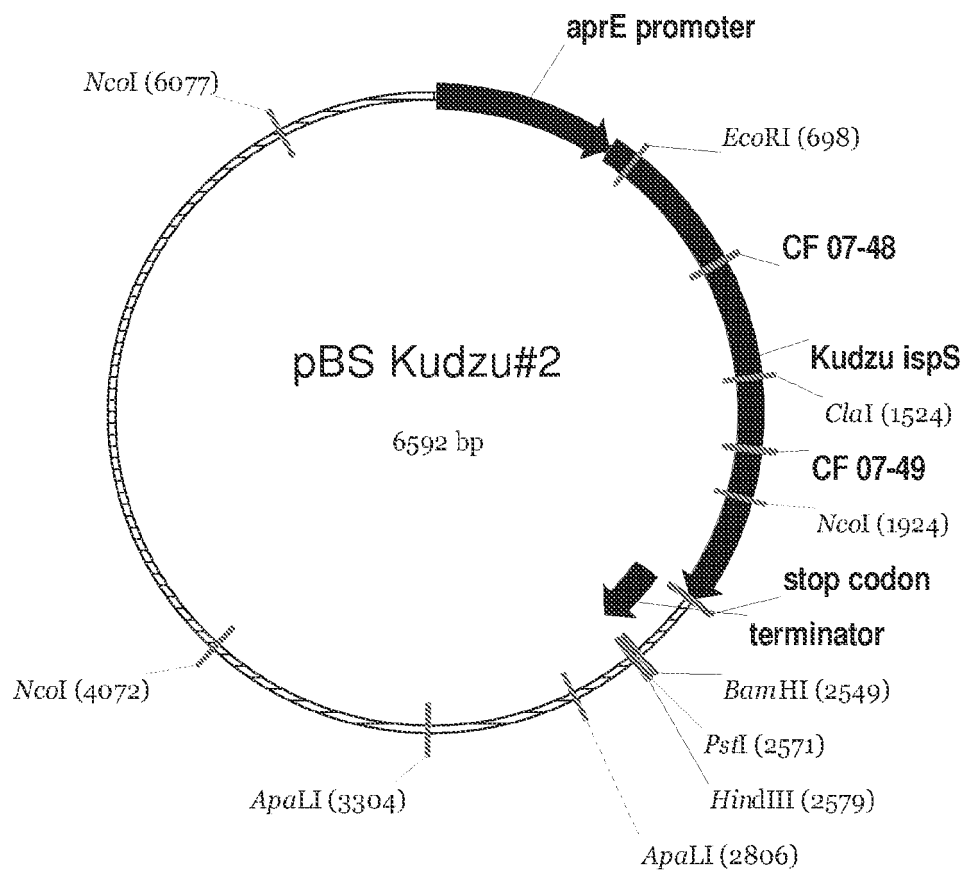
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(SEQ ID NO:56)

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Figure 52



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Figure 53A

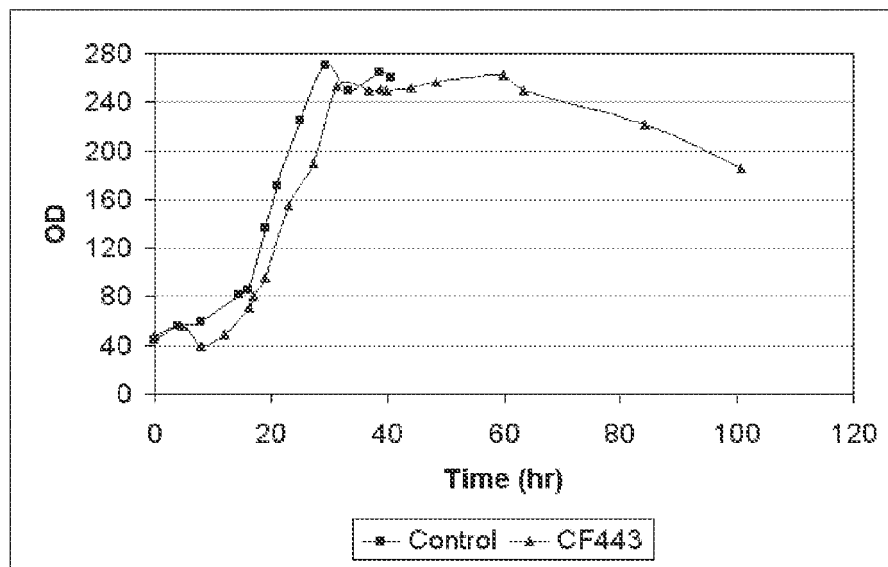
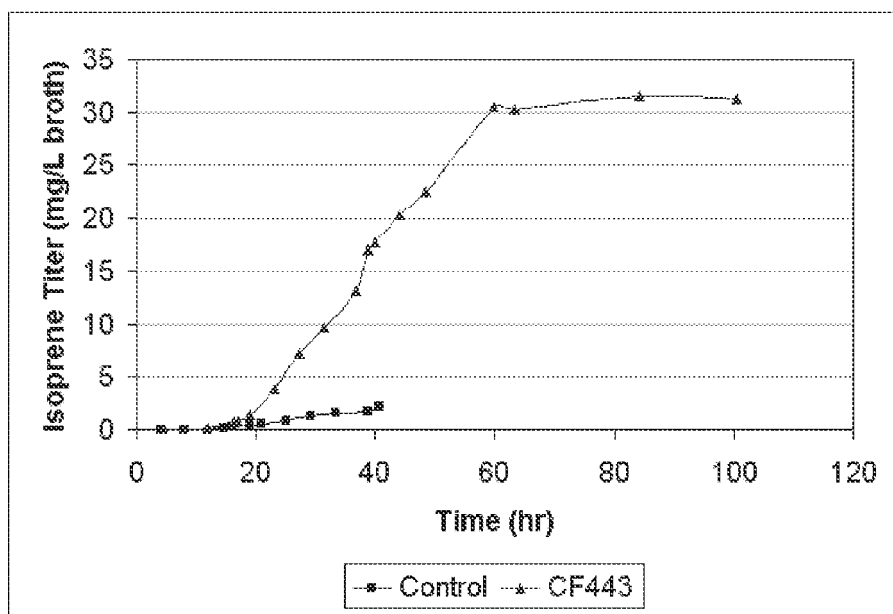


Figure 53B



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Figure 54

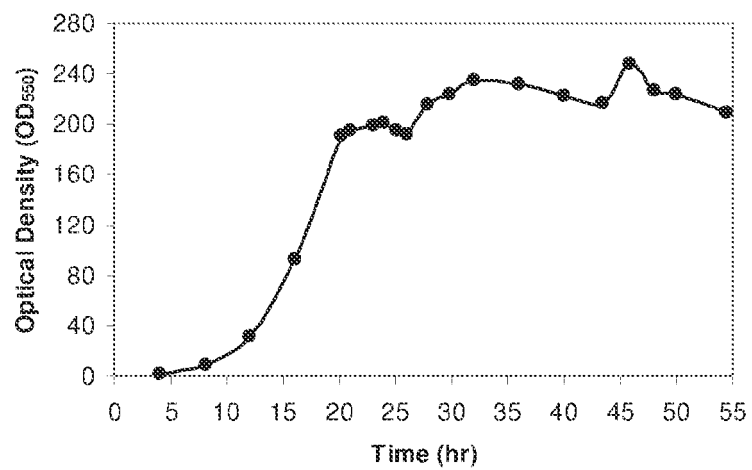
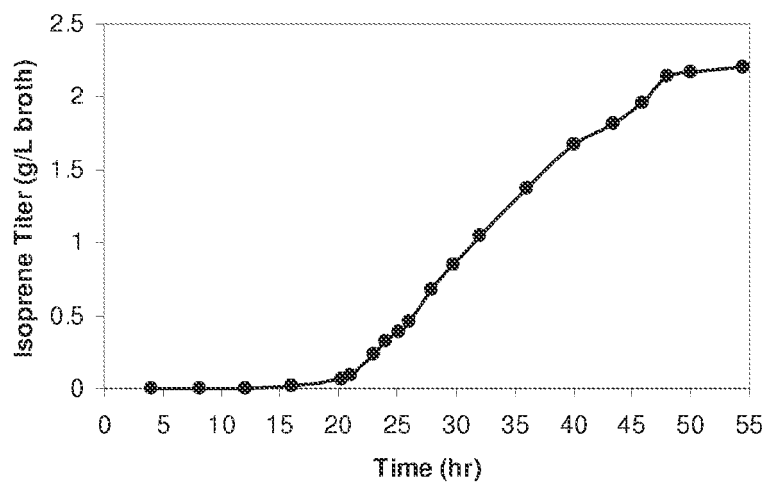


Figure 55



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Figure 56

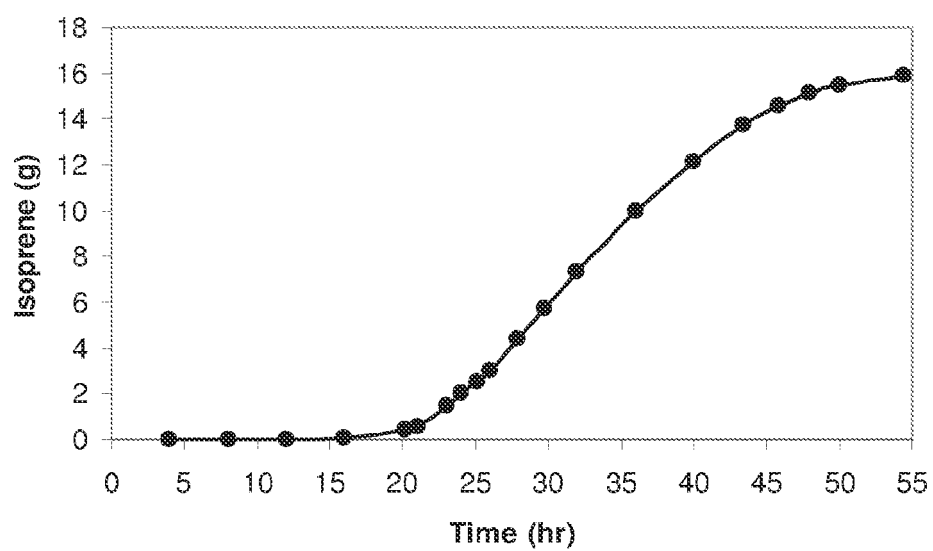
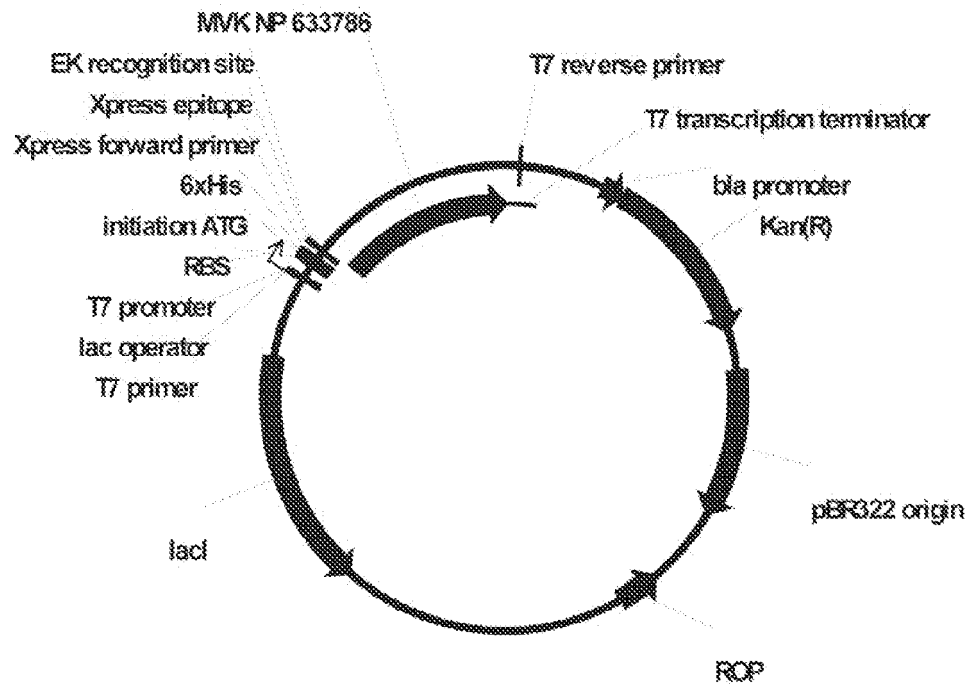


Figure 57A



MKB376 - MKB from *M. mazei* archeal Lowerin pET200D
6647bp

Figure 57B

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Figure 57C

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Figure 58A

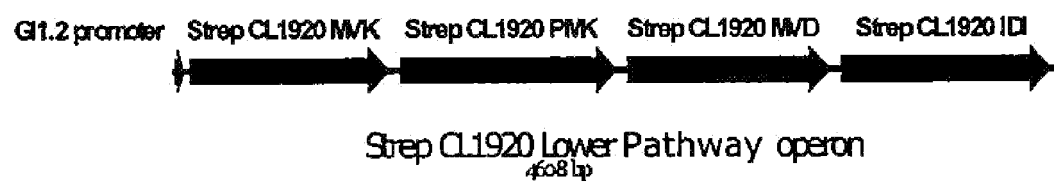


Figure 58C

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Figure 59A

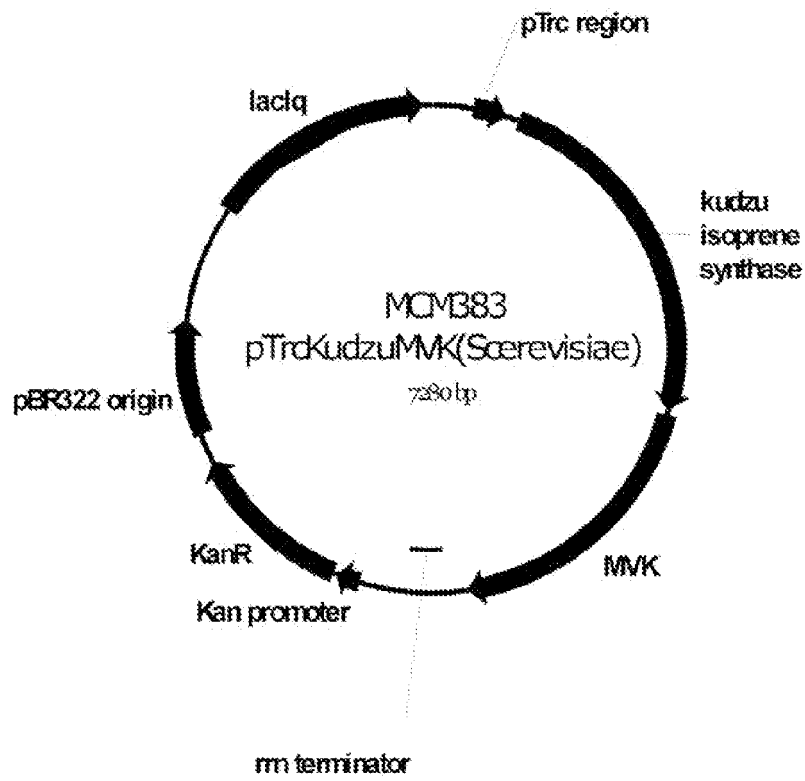


Figure 59C

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Figure 60

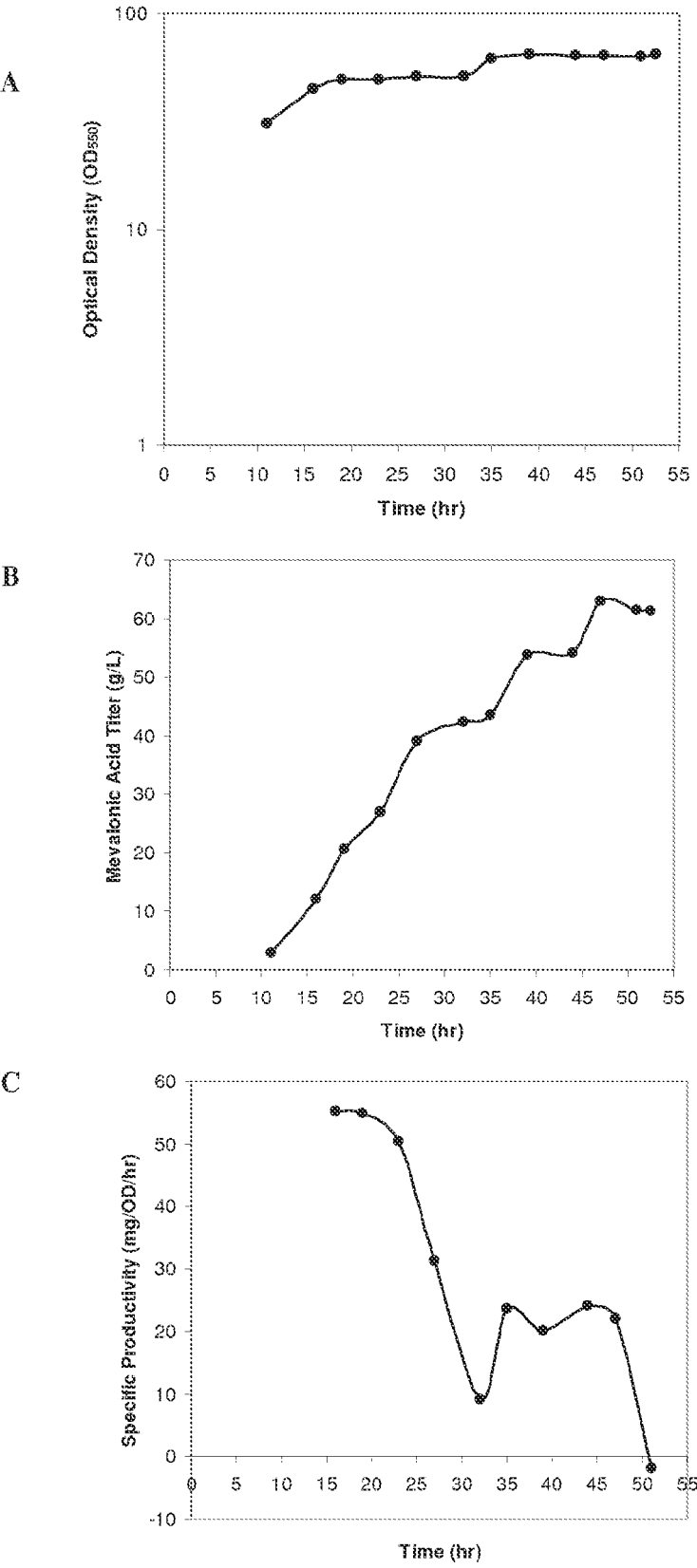
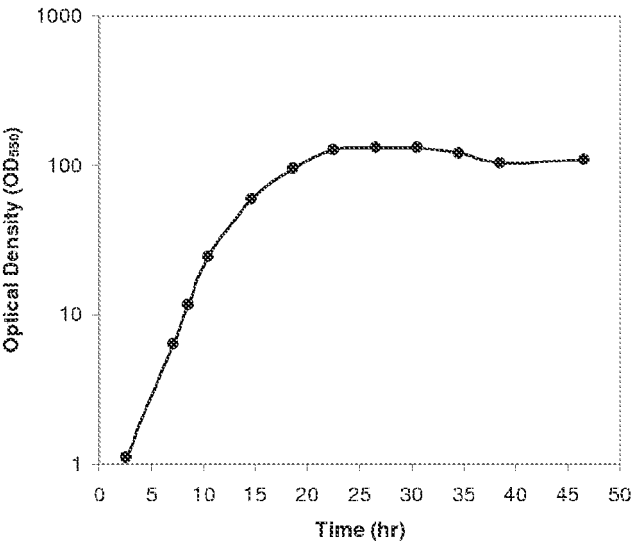
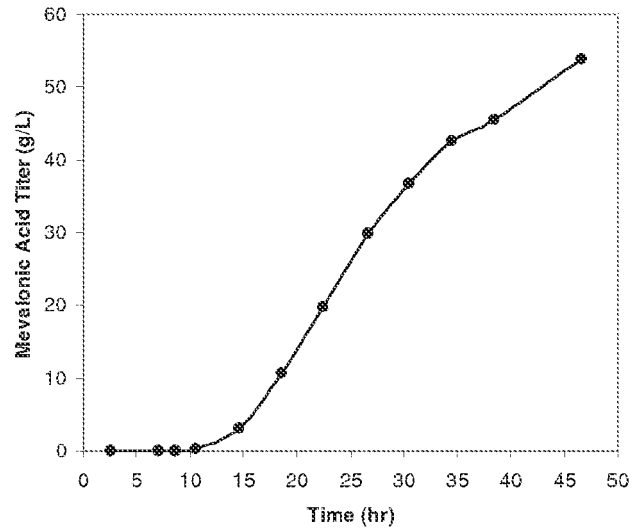


Figure 61

A



B



C

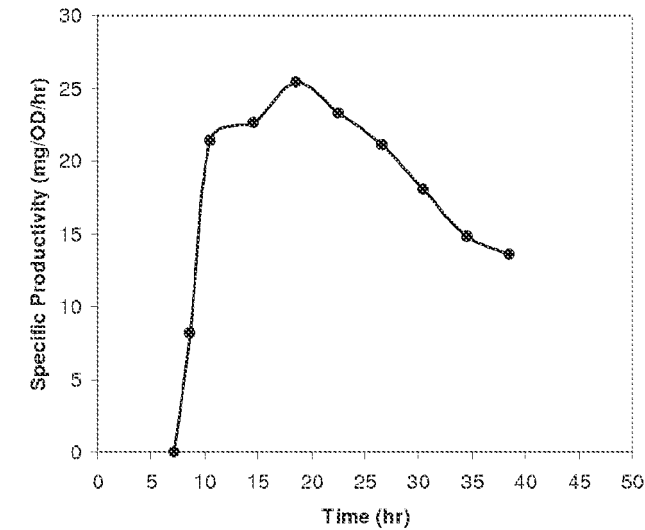
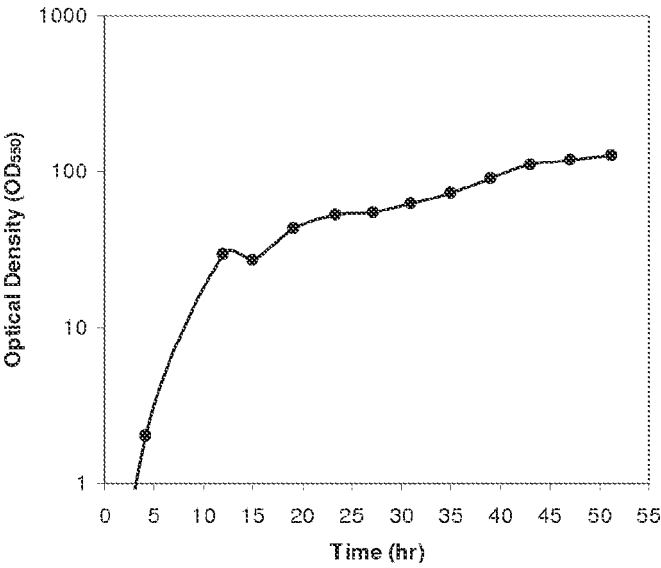
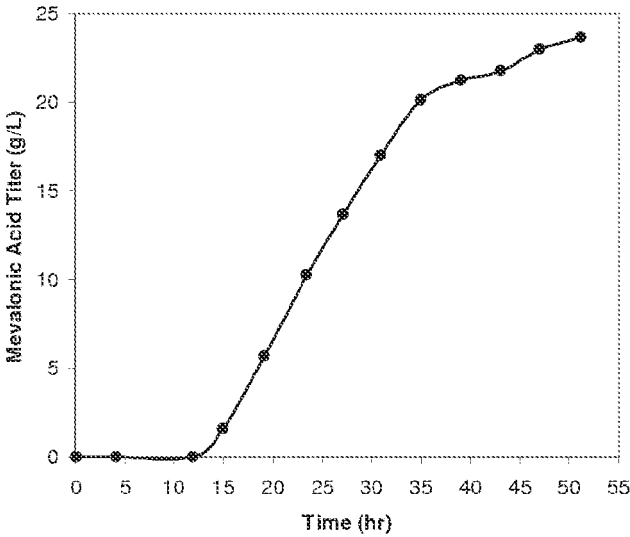


Figure 62

A



B



C

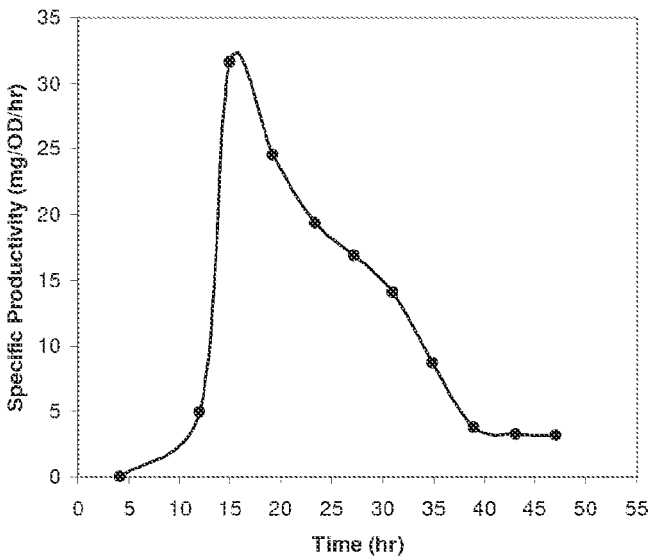


Figure 63

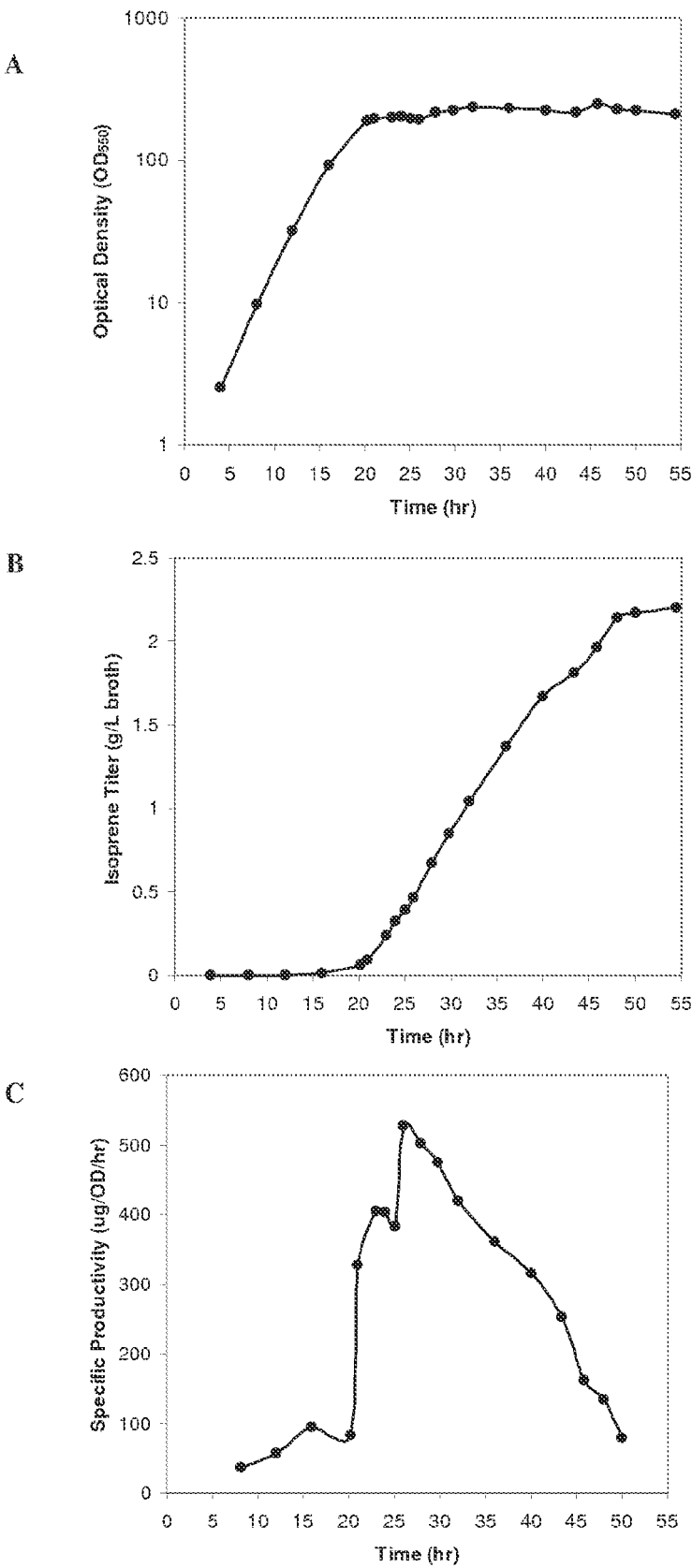
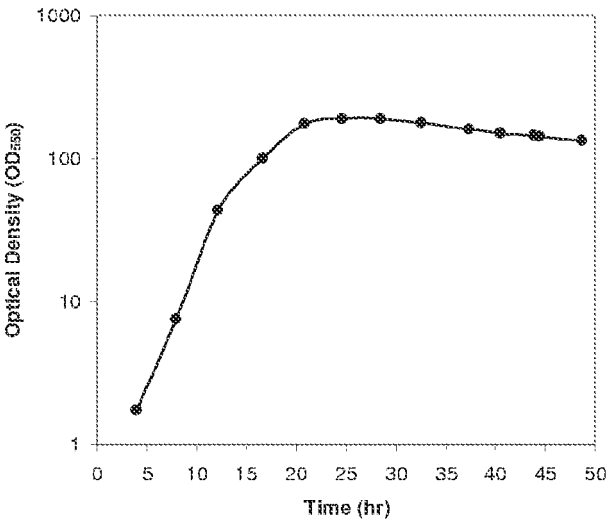
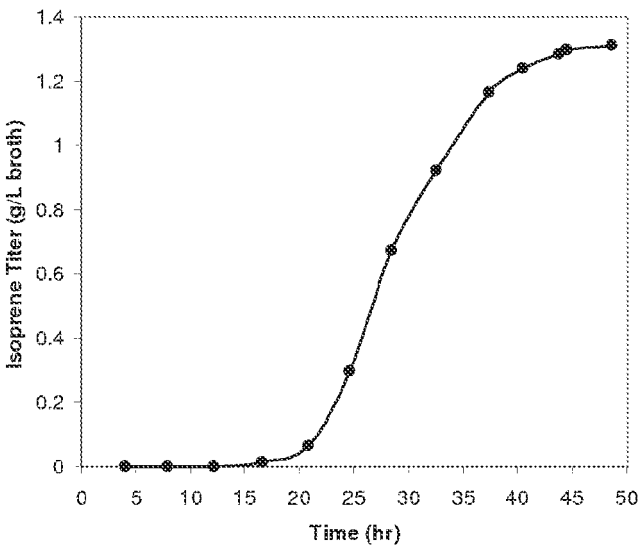


Figure 64

A



B



C

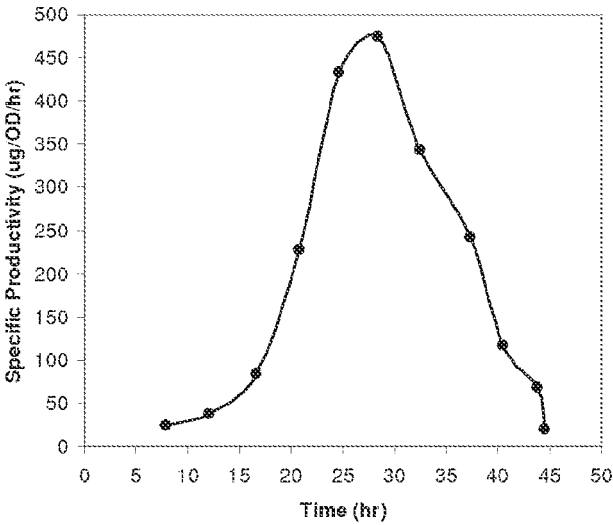


Figure 65

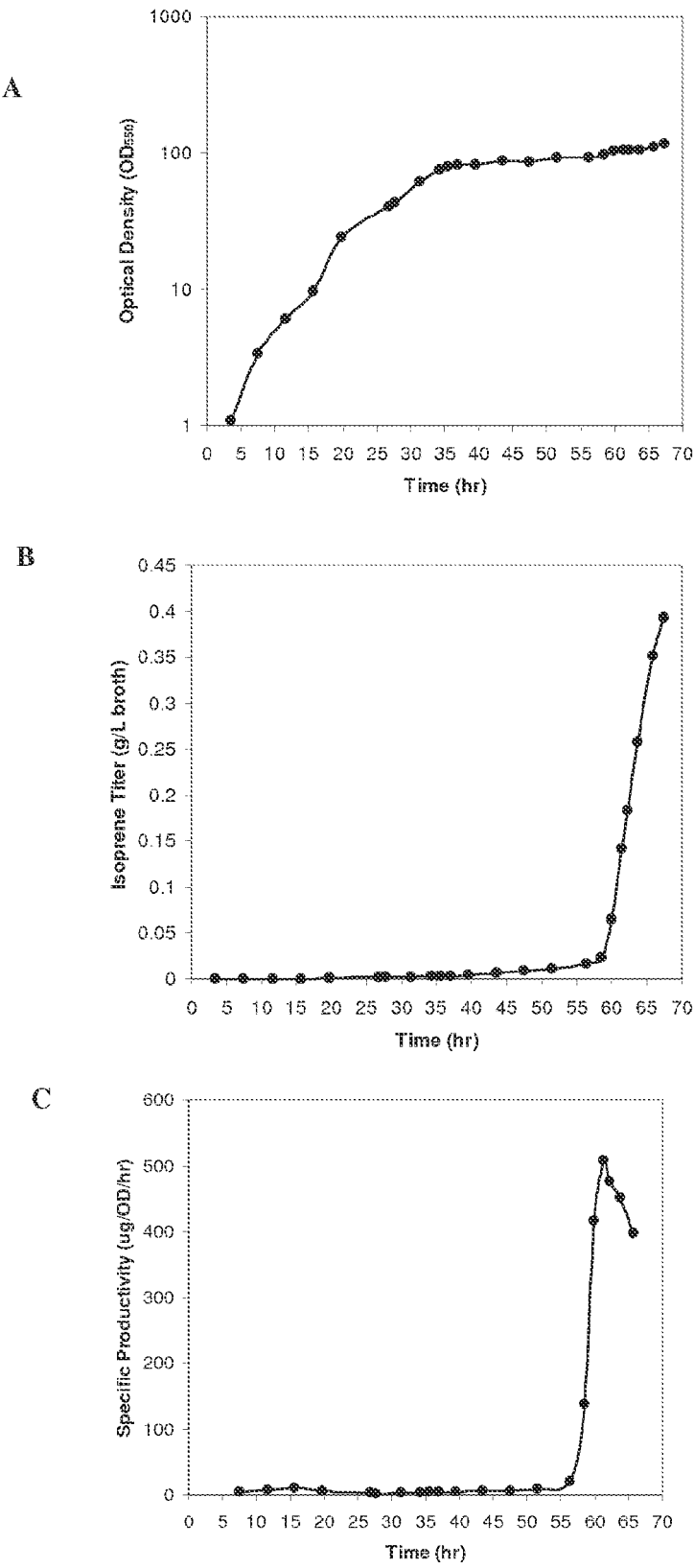


Figure 66

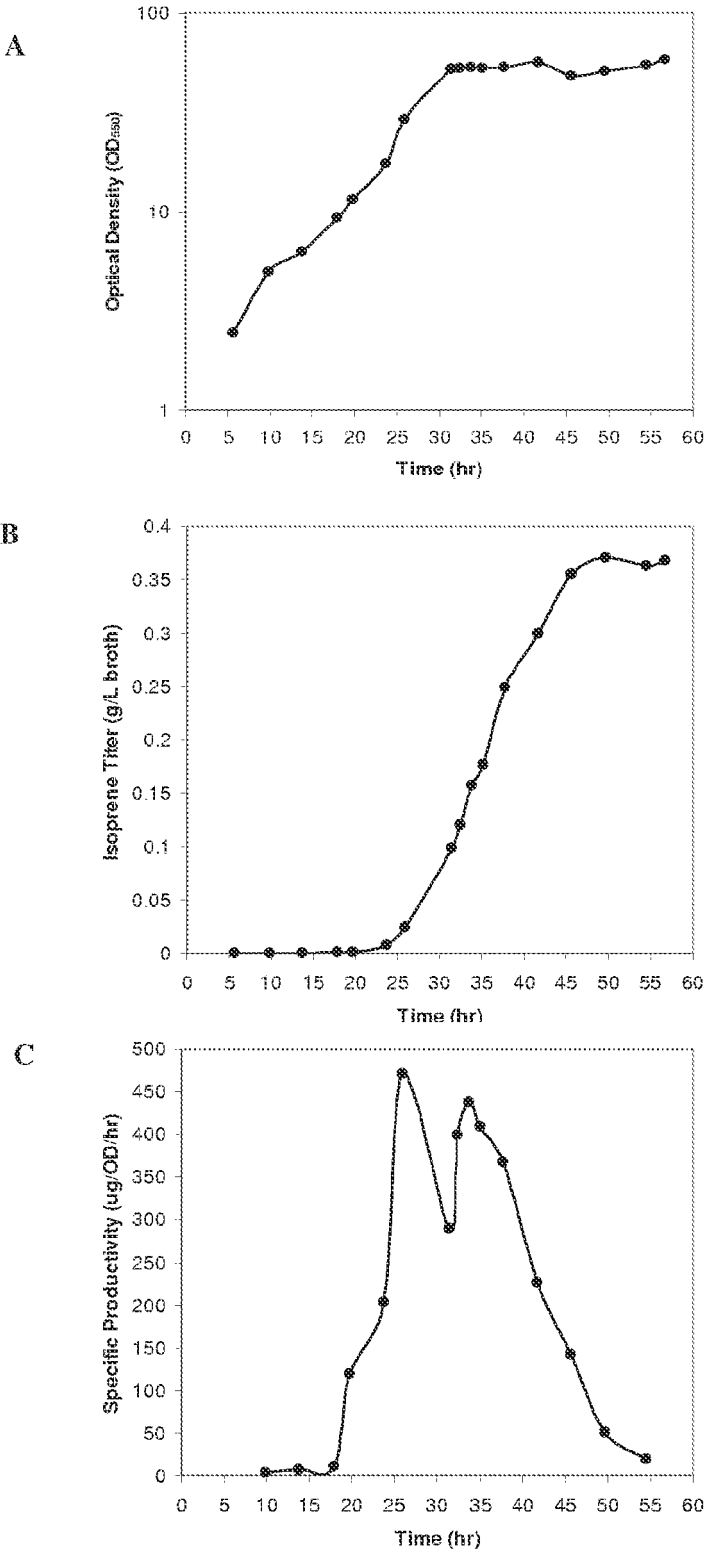
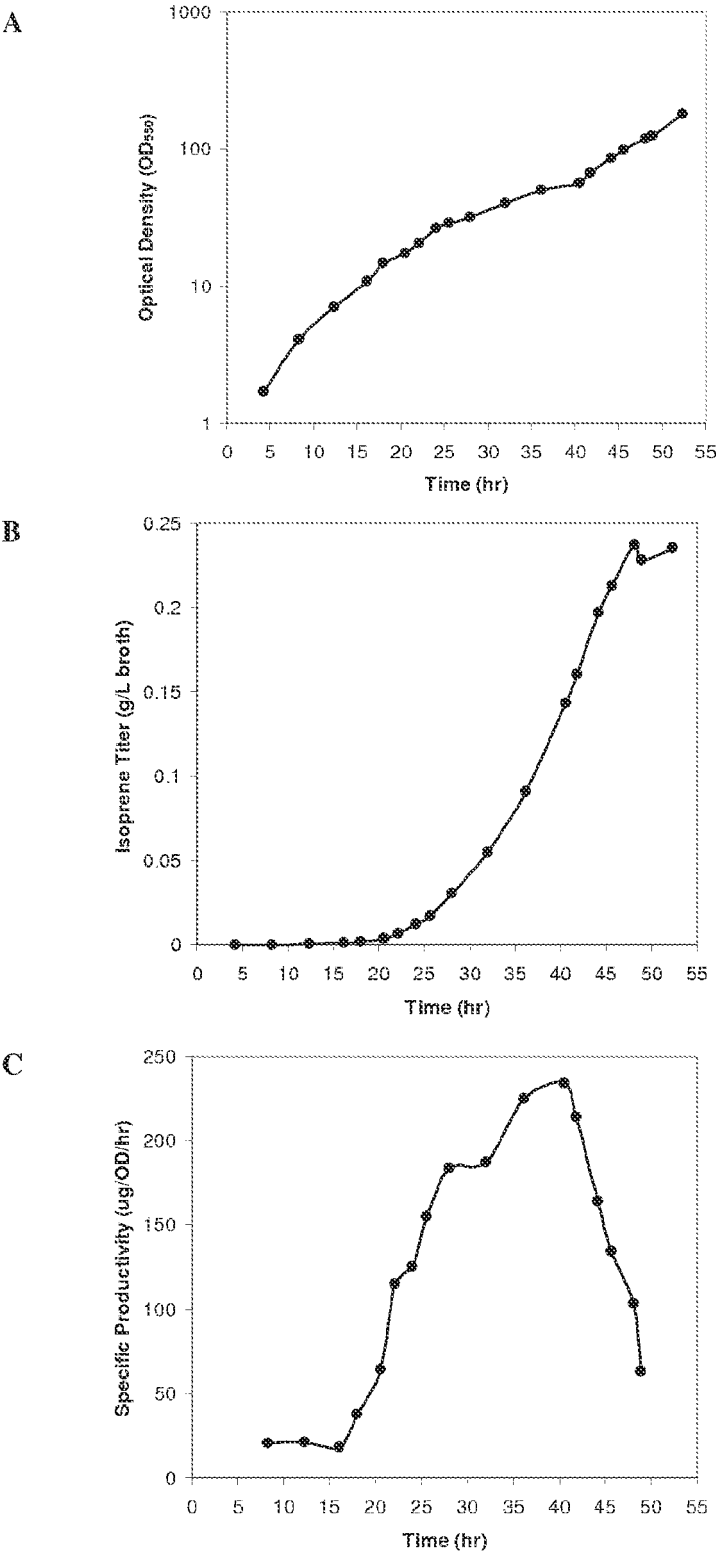


Figure 67



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Figure 68

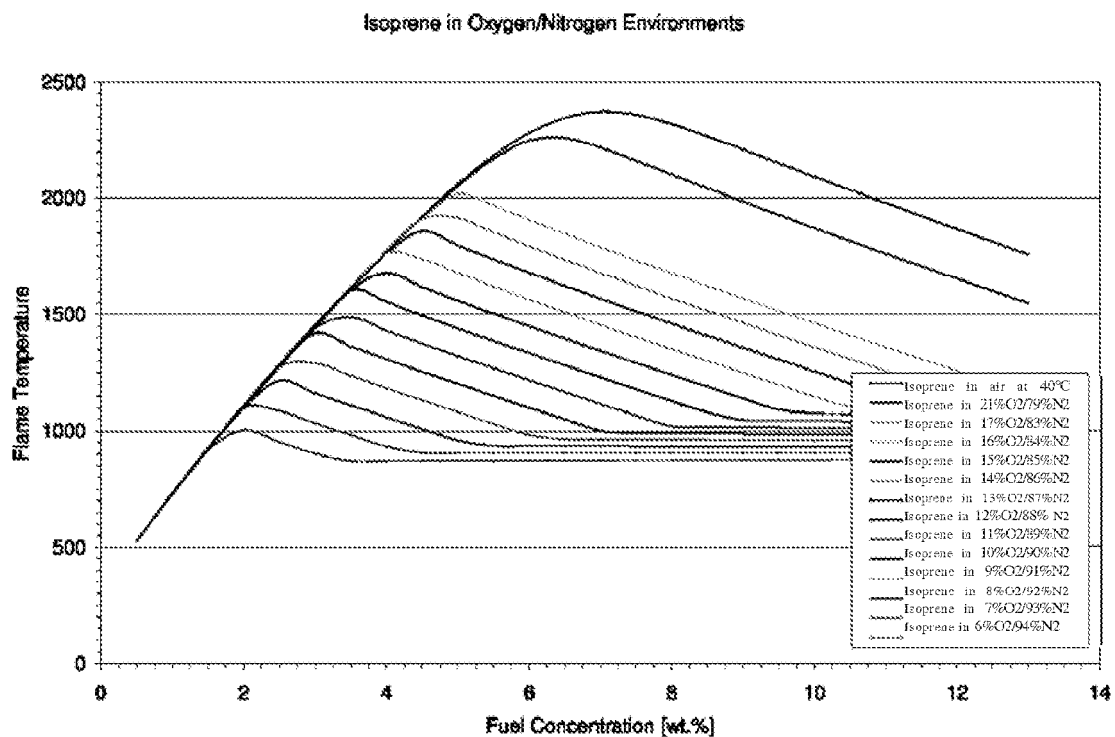
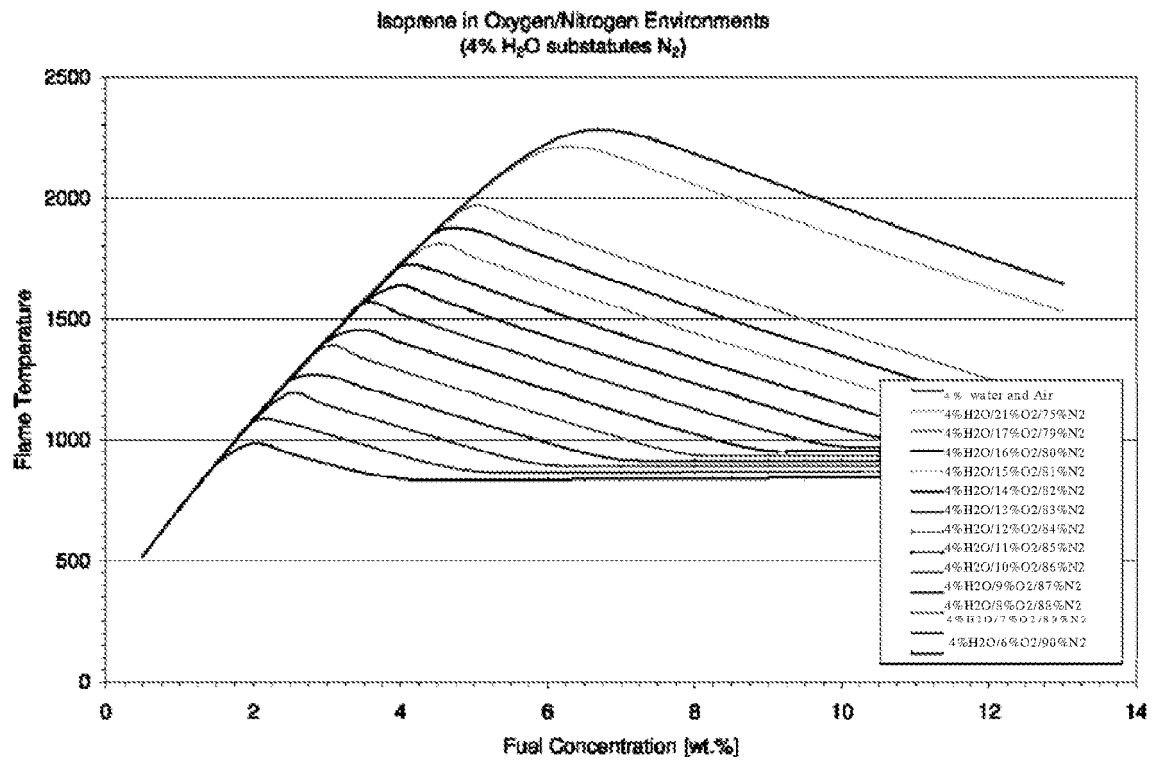
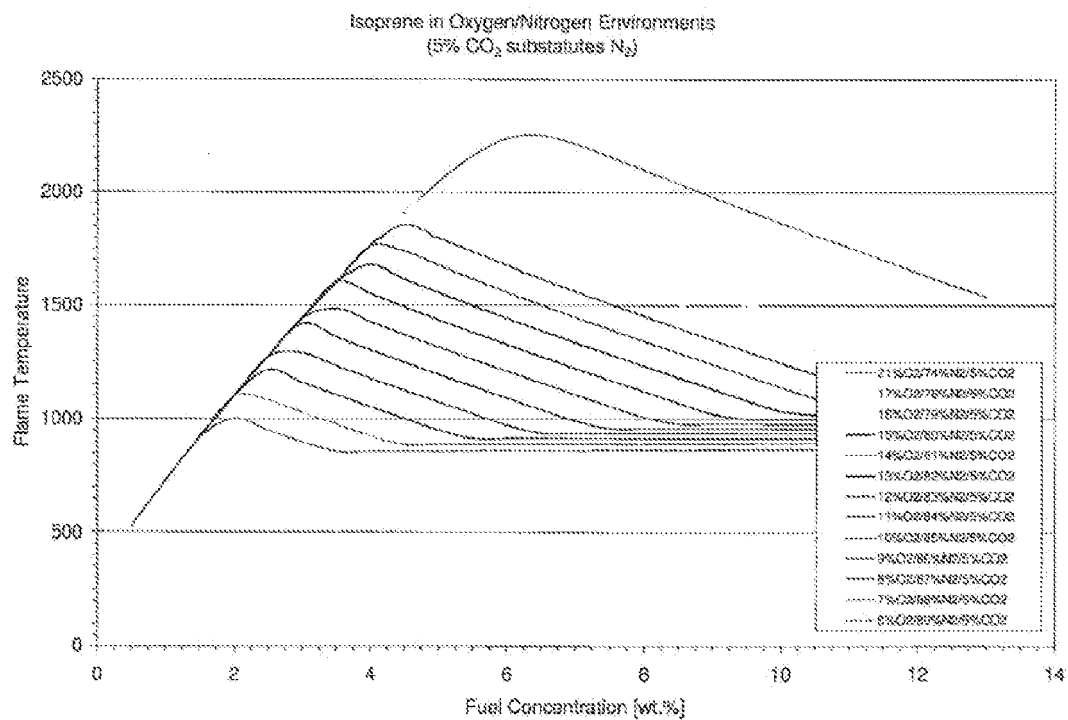


Figure 69



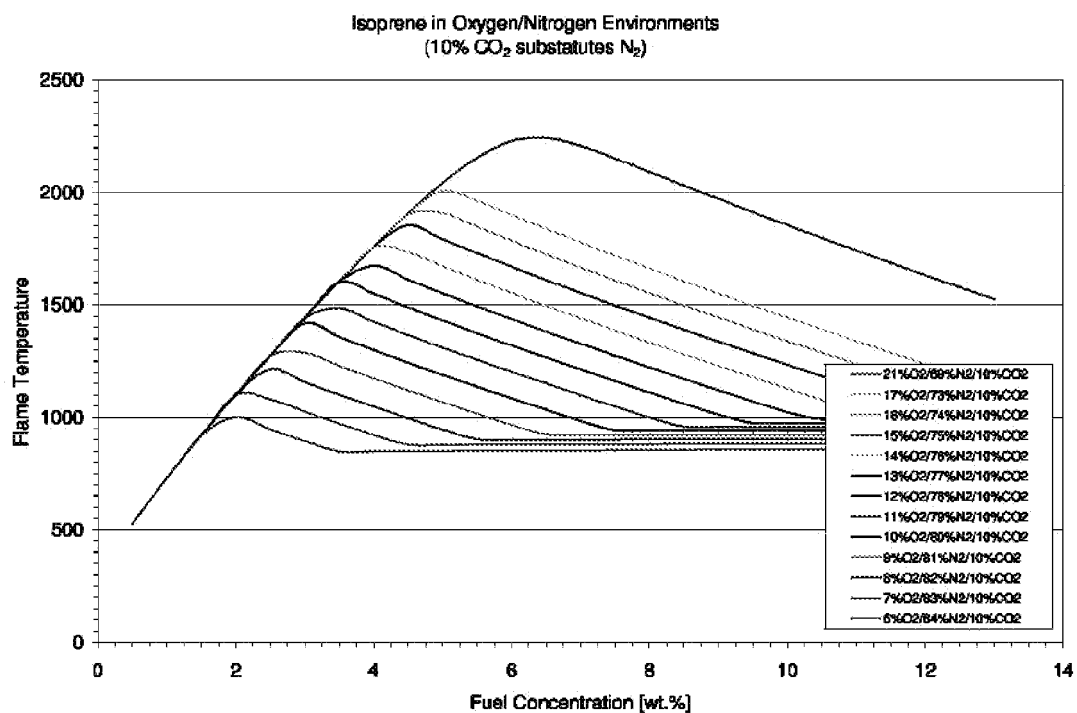
140/251

Figure 70



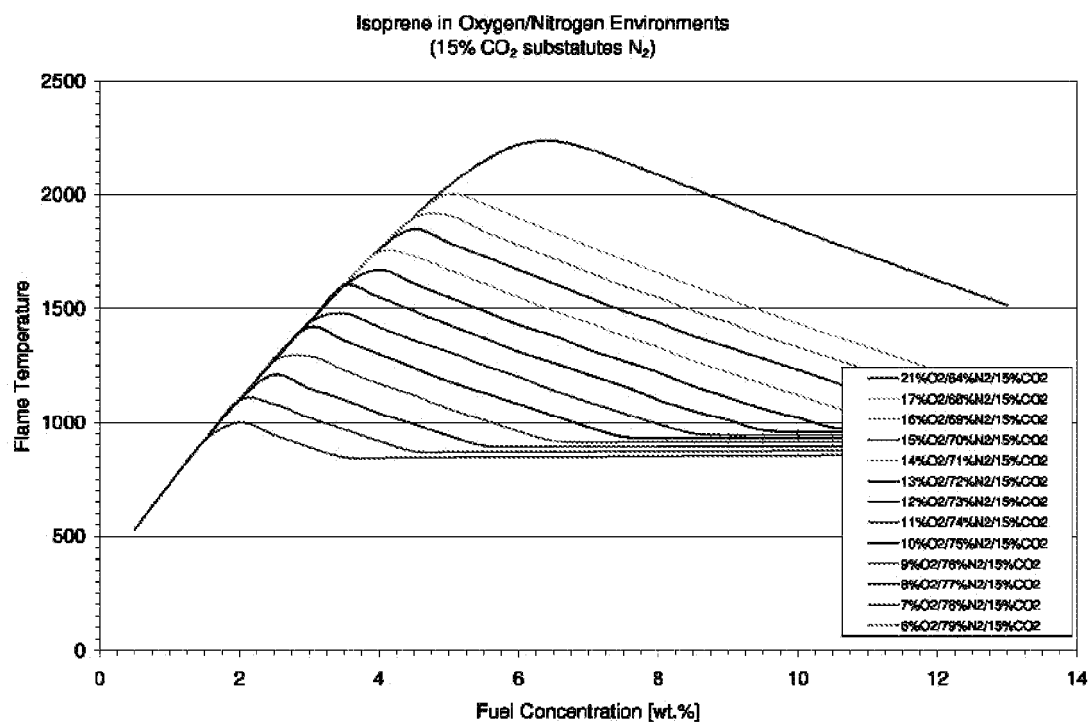
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Figure 71



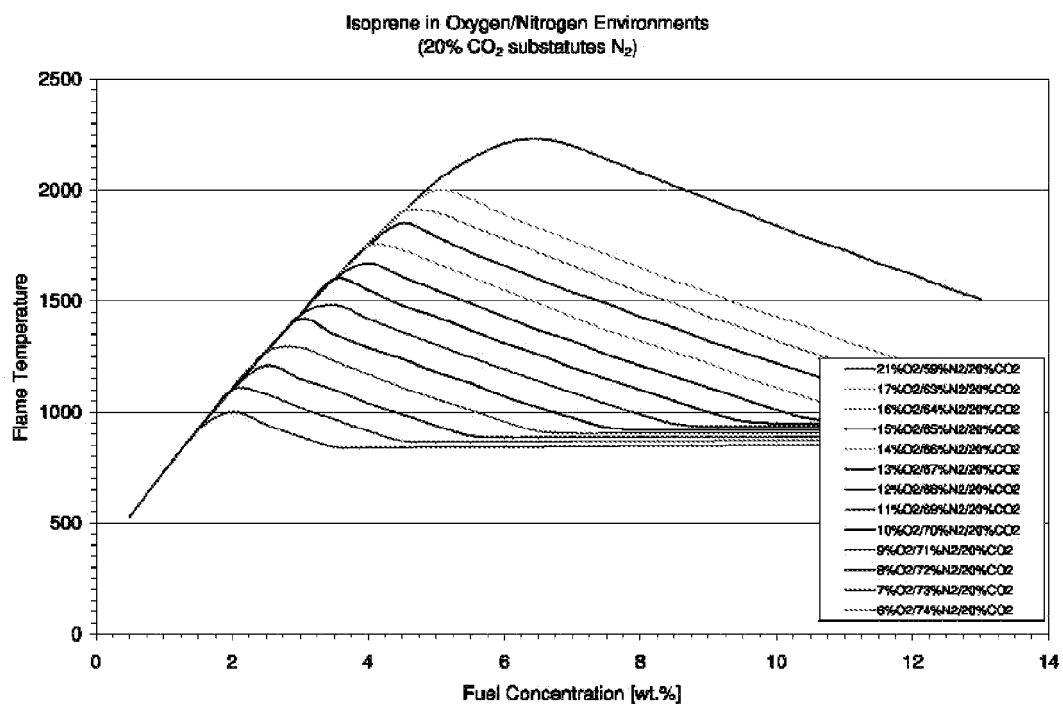
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Figure 72



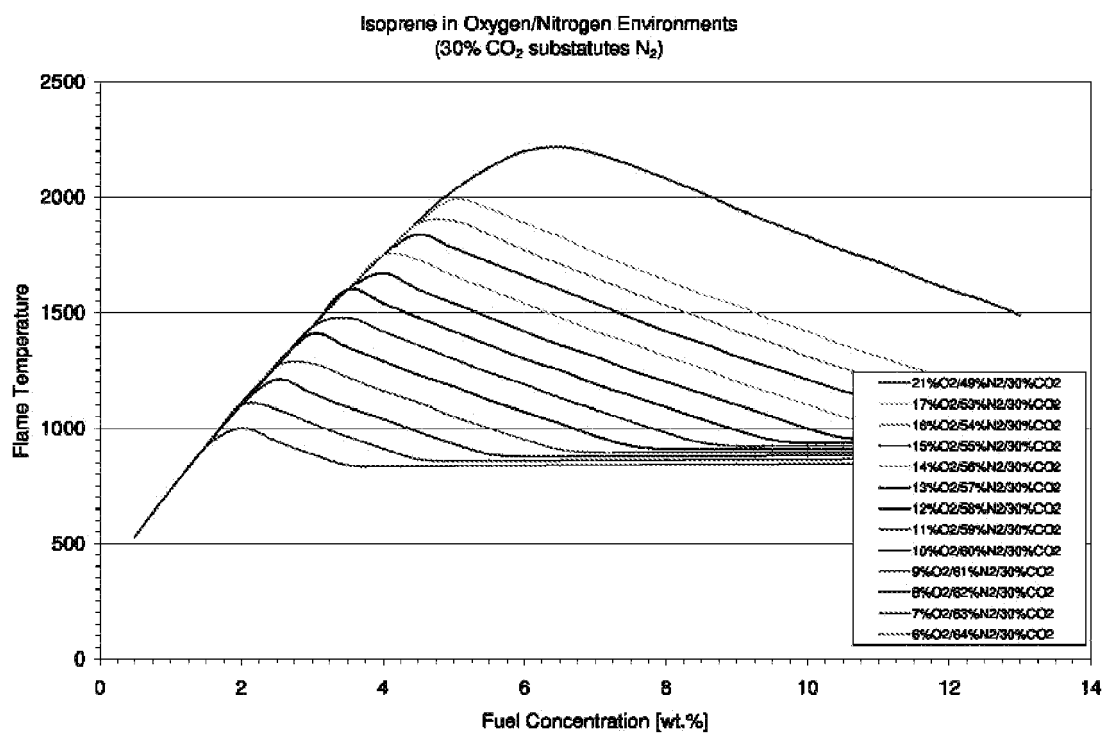
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Figure 73



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Figure 74



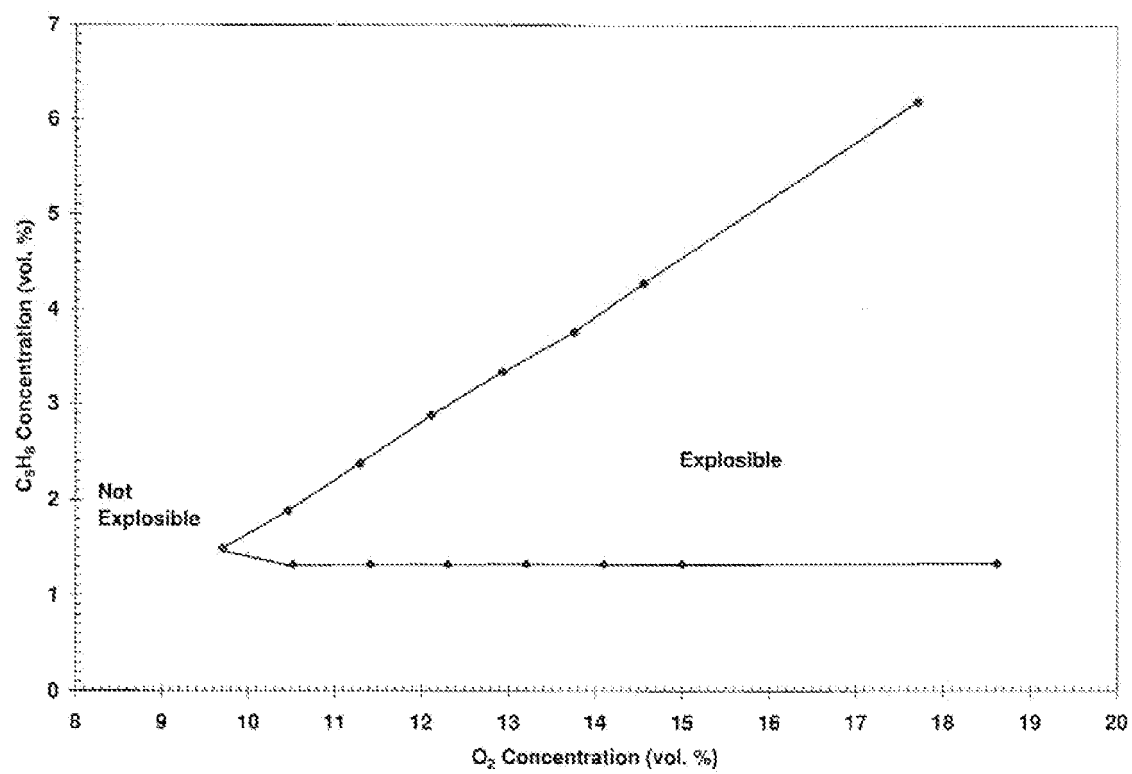
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Figure 75A

Concentration at Deflagration														
Fuel Makeup			Oxidizer Makeup			Molar Concentration based on 100g of sample				Volumetric Concentrations based on ideal gas law				
Fuel Conc. (wt. %)	Oxidizer Conc. (wt. %)	Isoprene (wt. %)	H ₂ O (wt. %)	O ₂ (wt. %)	N ₂ (wt. %)	Isoprene (mole)	H ₂ O (mole)	O ₂ (mole)	N ₂ (mole)	Total (mole)	Isoprene (vol. %)	O ₂ (vol. %)	N ₂ (vol. %)	H ₂ O (vol. %)
3.10	96.90	100	0	12	88	4.56	0.00	36.34	304.54	345.44	1.32	10.52	88.16	0.00
3.10	96.90	100	0	13	87	4.56	0.00	39.37	301.08	345.01	1.32	11.41	87.27	0.00
3.10	96.90	100	0	14	86	4.56	0.00	42.39	297.62	344.57	1.32	12.30	86.37	0.00
3.10	96.90	100	0	15	85	4.56	0.00	45.42	294.16	344.14	1.32	13.20	85.48	0.00
3.10	96.90	100	0	16	84	4.56	0.00	48.45	290.70	343.71	1.33	14.10	84.58	0.00
3.10	96.90	100	0	17	83	4.56	0.00	51.48	287.24	343.28	1.33	15.00	83.68	0.00
3.10	96.90	100	0	21	79	4.56	0.00	63.59	273.40	341.55	1.33	18.62	80.05	0.00
3.50	96.50	100	0	11.1	88.9	5.15	0.00	33.47	306.39	345.01	1.49	9.70	88.81	0.00
4.40	95.60	100	0	12	88	6.47	0.00	35.85	300.46	342.78	1.89	10.46	87.65	0.00
5.50	94.50	100	0	13	87	8.09	0.00	38.39	293.63	340.10	2.38	11.29	86.33	0.00
6.60	93.40	100	0	14	86	9.71	0.00	40.86	286.87	337.44	2.88	12.11	85.01	0.00
7.60	92.40	100	0	15	85	11.18	0.00	43.31	280.50	334.99	3.34	12.93	83.73	0.00
8.50	91.50	100	0	16	84	12.50	0.00	45.75	274.50	332.75	3.76	13.75	82.49	0.00
9.60	90.40	100	0	17	83	14.12	0.00	48.03	267.97	330.11	4.28	14.55	81.18	0.00
13.50	86.50	100	0	21	79	19.85	0.00	56.77	244.05	320.67	6.19	17.70	76.11	0.00

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Figure 75B



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Figure 76A

Concentration at Deflagration															
		Fuel Makeup	Oxidizer Makeup				Molar Concentration based on 100g of sample					Volumetric Concentrations based on ideal gas law			
Fuel Conc.	Oxidizer Conc.	Isoprene (wt. %)	H ₂ O (wt. %)	O ₂ (wt. %)	N ₂ (wt. %)	Isoprene (mole)	H ₂ O (mole)	O ₂ (mole)	N ₂ (mole)	Total (mole)	Isoprene (vol. %)	O ₂ (vol. %)	N ₂ (vol. %)	H ₂ O (vol. %)	
3.252	96.748	100	4	12	84	4.78	21.50	36.28	290.24	352.81	1.36	10.28	82.27	6.09	
3.274	96.726	100	4	13	83	4.81	21.49	39.29	286.72	352.33	1.37	11.15	81.38	6.10	
3.290	96.710	100	4	14	82	4.84	21.49	42.31	283.22	351.86	1.38	12.02	80.49	6.11	
3.288	96.712	100	4	15	81	4.84	21.49	45.33	279.77	351.43	1.38	12.90	79.61	6.12	
3.286	96.714	100	4	16	80	4.83	21.49	48.36	276.33	351.01	1.38	13.78	78.72	6.12	
3.284	96.716	100	4	17	79	4.83	21.49	51.38	272.88	350.58	1.38	14.66	77.84	6.13	
3.276	96.724	100	4	21	75	4.82	21.49	63.48	259.08	348.87	1.38	18.19	74.26	6.16	
3.500	96.500	100	4	11.5	84.5	5.15	21.44	34.68	291.22	352.49	1.46	9.84	82.62	6.08	
4.200	95.800	100	4	12	84	6.18	21.29	35.93	287.40	350.79	1.76	10.24	81.93	6.07	
5.300	94.700	100	4	13	83	7.79	21.04	38.47	280.72	348.03	2.24	11.05	80.66	6.05	
6.400	93.600	100	4	14	82	9.41	20.80	40.95	274.11	345.28	2.73	11.86	79.39	6.02	
7.400	92.600	100	4	15	81	10.88	20.58	43.41	267.88	342.74	3.18	12.66	78.16	6.00	
8.500	91.500	100	4	16	80	12.50	20.33	45.75	261.43	340.01	3.68	13.46	76.89	5.98	
9.400	90.600	100	4	17	79	13.82	20.13	48.13	255.62	337.71	4.09	14.25	75.69	5.96	
13.300	86.700	100	4	21	75	19.56	19.27	56.90	232.23	327.95	5.96	17.35	70.81	5.87	

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Figure 76B

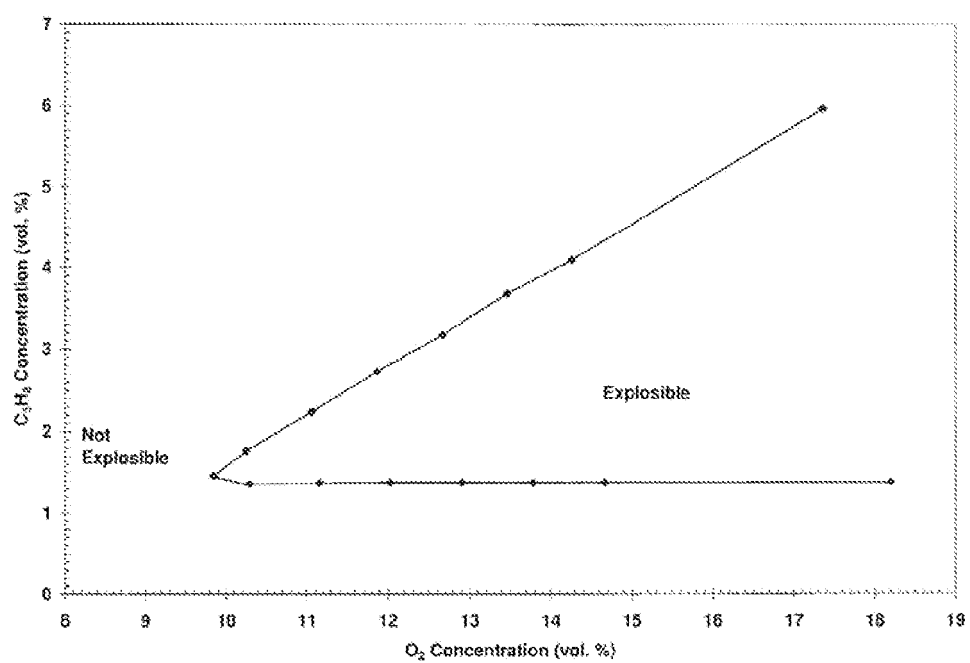
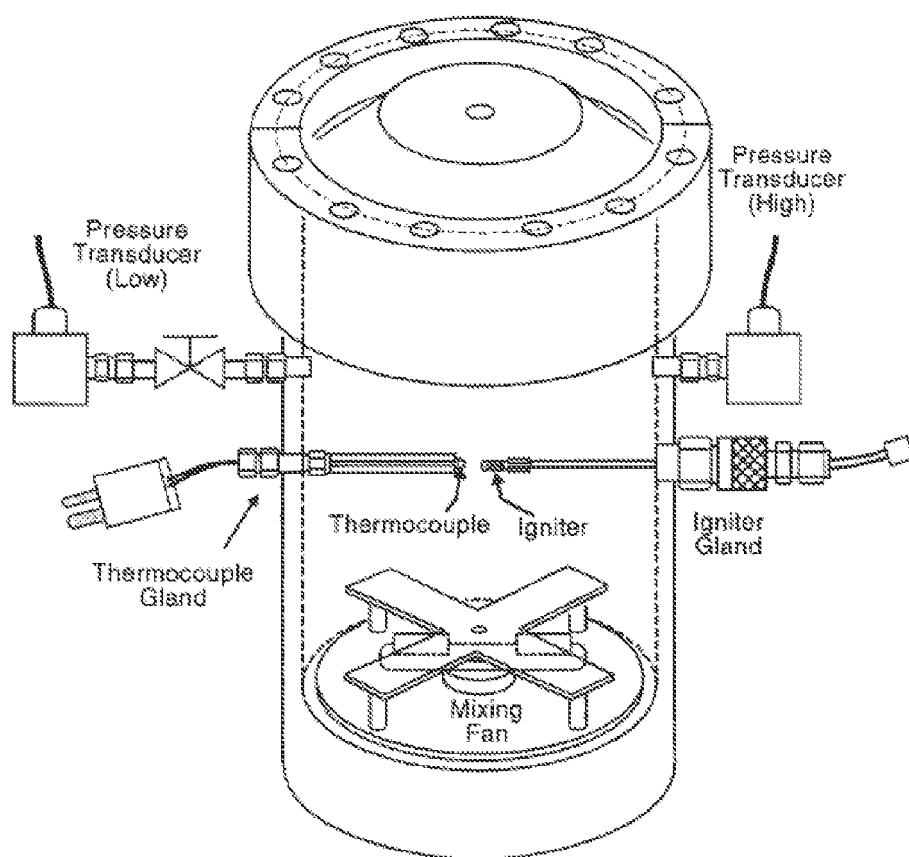


Figure 77



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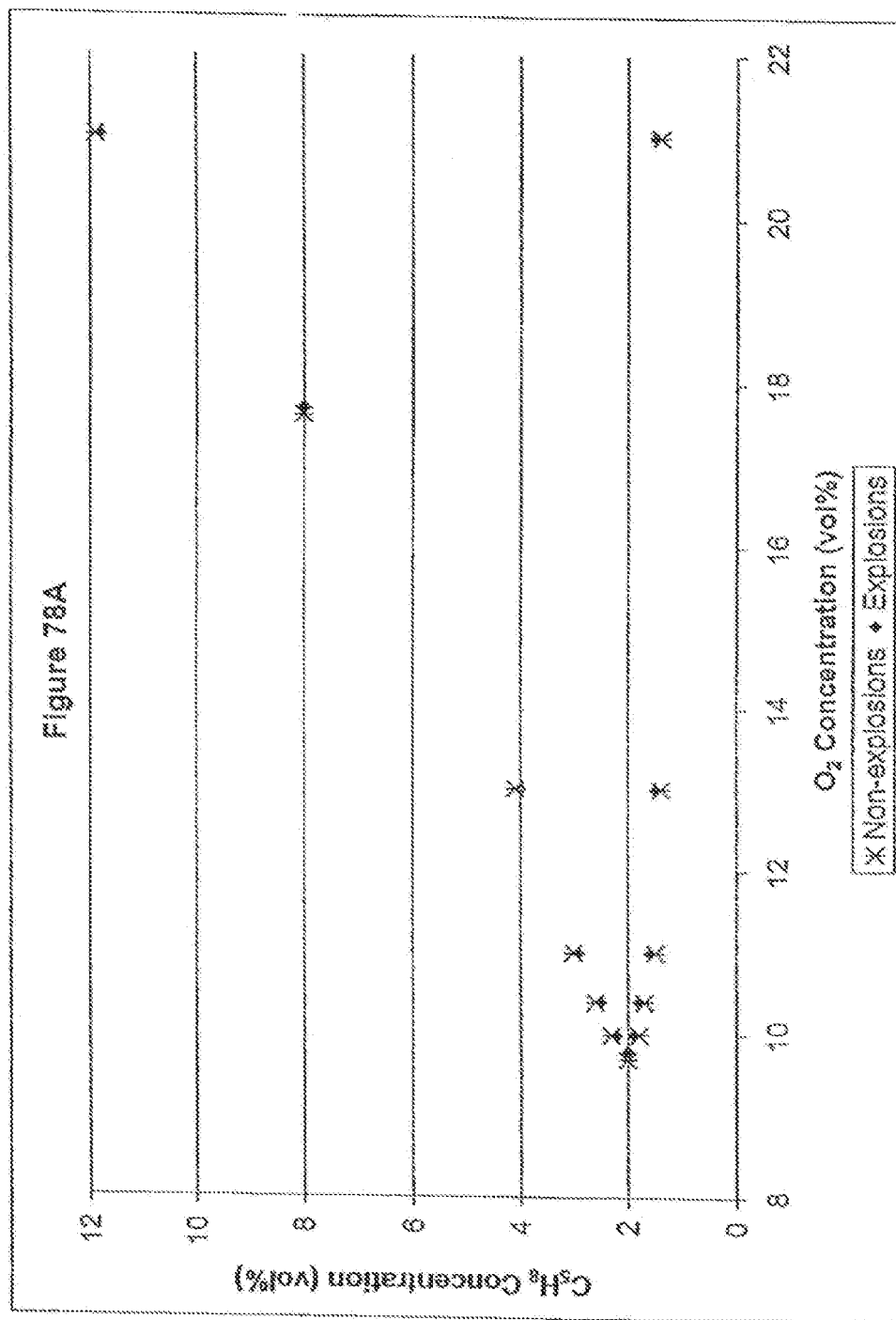


Figure 78B

Explosions		Non-explosions	
O ₂ Concentration (vol. %)	C ₅ H ₈ Concentration (vol. %)	O ₂ Concentration (vol. %)	C ₅ H ₈ Concentration (vol. %)
21.0	1.5	21.0	1.4
13.0	1.5	13.0	1.4
11.0	1.6	11.0	1.5
10.4	1.8	10.4	1.7
10.0	1.9	10.0	1.8
9.8	2	9.7	2
10.0	2.2	10.0	2.3
10.4	2.5	10.4	2.6
11.0	2.9	11.0	3.0
13.0	4.0	13.0	4.1
17.7	8.0	17.6	8.0
21.0	11.8	21.0	11.9

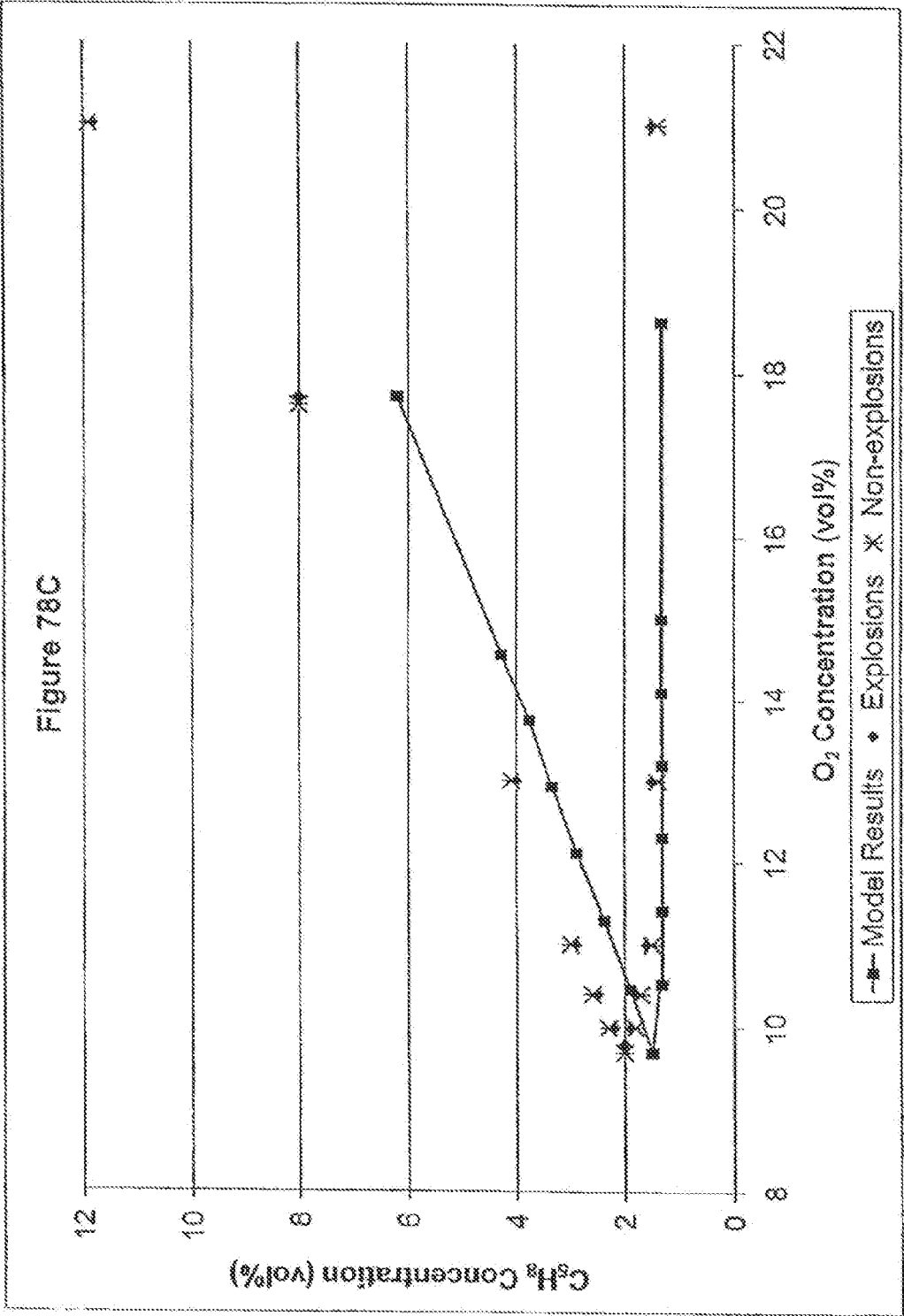


Figure 79A

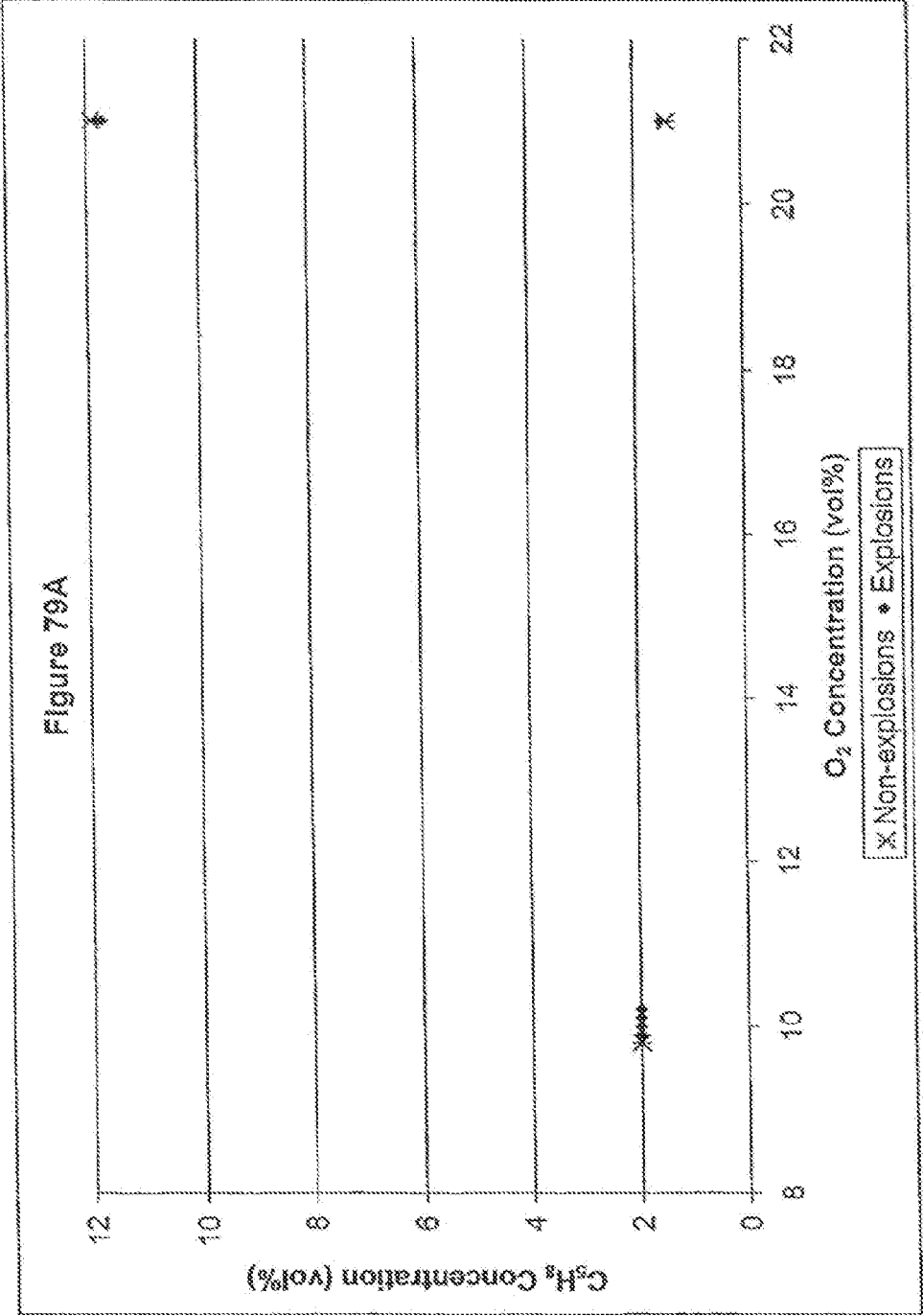


Figure 79B

Explosions		Non-explosions	
O ₂ Concentration	C ₅ H ₈ Concentration	O ₂ Concentration	C ₅ H ₈ Concentration
(vol. %)	(vol. %)	(vol. %)	(vol. %)
21.0	11.7	21.0	11.9
21.0	11.8	21.0	11.9
21.0	11.8	21.0	11.9
21.0	1.5	21.0	1.4
21.0	1.5	21.0	1.4
10.2	2.0	21.0	1.4
10.1	2.0	9.8	2.0
10.0	2.0	9.8	2.0
9.9	2.0	9.8	2.0

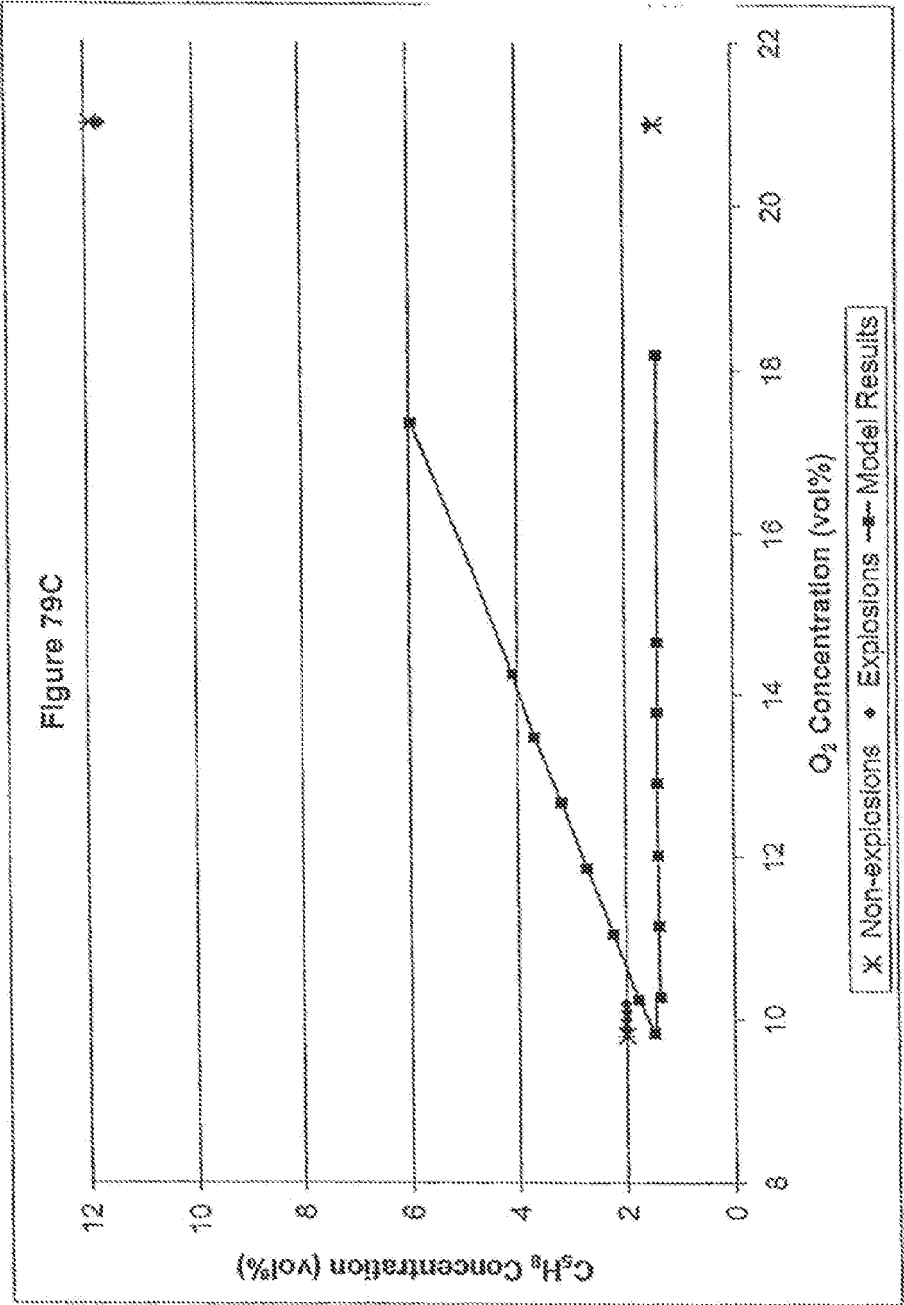


Figure 80A

TEST SERIES 1

Test	Data File Name	Temp °C	Initial Pressure bara	Partial Pressures			Concentrations			Result	P _{ex} bara
				C ₅ H ₈	N ₂	O ₂	C ₅ H ₈	N ₂	O ₂		
				mbar	mbar	mbar	vol. %	vol. %	vol. %		
1	T11120700	40	1.012	12	787	213	1.2	77.8	21.0	Non-Explosion	1.05
2	T11120701	40	1.016	16	787	213	1.6	77.5	21.0	Explosion	5.5
3	T11120702	40	1.015	14	786	213	1.4	77.6	21.0	Non-Explosion	<1.02
4	T11120703	40	1.014	15	786	213	1.5	77.5	21.0	Non-Explosion	<1.02
5	T11120704	40	1.014	15	786	213	1.5	77.5	21.0	Explosion	4.31
6	T11120705	40	1.017	18	785	214	1.8	77.2	21.0	Explosion	5.47
7	T11120706	40	1.014	15	786	213	1.5	77.5	21.0	Explosion	4.51
8	T11120707	40	1.014	14	787	213	1.4	77.6	21.0	Non-Explosion	<1.02
9	T11120708	40	1.014	14	787	213	1.4	77.6	21.0	Non-Explosion	1.05
10	T11120709	40	1.015	102	700	213	10.0	69.0	21.0	Explosion	1.45
11	T11120710	40	1.014	102	699	213	10.1	68.9	21.0	Explosion	1.39
12	T11120711	40	1.014	106	695	213	10.5	68.5	21.0	Explosion	1.34
13	T11120712	40	1.014	113	688	213	11.1	67.9	21.0	Explosion	1.29
14	T11120713	40	1.014	122	679	213	12.0	67.0	21.0	Non-Explosion	<1.02
15	T11120714	40	1.014	117	684	213	11.5	67.5	21.0	Explosion	1.32
16	T11120715	40	1.014	120	681	213	11.8	67.2	21.0	Non-Explosion	1.08
17	T11130700	40	1.014	120	681	213	11.8	67.2	21.0	Explosion	1.09
18	T11130701	40	1.014	121	680	213	11.9	67.1	21.0	Non-Explosion	1.07
19	T11130702	40	1.015	121	681	213	11.9	67.1	21.0	Non-Explosion	1.06
20	T11130703	40	1.015	121	681	213	11.9	67.1	21.0	Non-Explosion	1.07
21	T11130704	40	1.015	30	853	132	3.0	84.0	13.0	Explosion	1.61
22	T11130705	40	1.014	36	846	132	3.6	83.4	13.0	Explosion	1.28
23	T11130706	40	1.014	39	843	132	3.8	83.1	13.0	Explosion	1.12
24	T11130707	40	1.015	41	842	132	4.0	83.0	13.0	Explosion	1.09
25	T11130708	40	1.014	42	840	132	4.1	82.8	13.0	Non-Explosion	1.06
26	T11130709	40	1.015	42	841	132	4.1	82.9	13.0	Non-Explosion	1.06
27	T11130710	40	1.014	42	840	132	4.1	82.8	13.0	Non-Explosion	1.05
28	T11130711	40	1.014	15	867	132	1.5	85.5	13.0	Non-Explosion	1.03
29	T11130712	40	1.014	16	866	132	1.6	85.4	13.0	Explosion	4.81
30	T11130713	40	1.014	15	867	132	1.5	85.5	13.0	Explosion	4
31	T11130714	40	1.014	14	868	132	1.4	85.6	13.0	Non-Explosion	1.03
32	T11130715	40	1.014	14	868	132	1.4	85.6	13.0	Non-Explosion	<1.02
33	T11130716	40	1.014	14	868	132	1.4	85.6	13.0	Non-Explosion	1.03
34	T11130717	40	1.015	20	883	112	2.0	87.0	11.0	Explosion	1.7
35	T11130718	40	1.014	28	874	112	2.8	86.2	11.0	Non-Explosion	1.08
36	T11130719	40	1.014	28	874	112	2.8	86.2	11.0	Non-Explosion	1.08
37	T11130720	40	1.014	28	874	112	2.8	86.2	11.0	Explosion	1.13
38	T11130721	40	1.015	29	874	112	2.9	86.1	11.0	Non-Explosion	1.08
39	T11130722	40	1.014	29	873	112	2.9	86.1	11.0	Explosion	1.1

Figure 80B

Test	Data File Name	Temp °C	Initial Pressure bara	Partial Pressures			Concentrations			Result	Pex bara
				C ₅ H ₈ mbar	N ₂ mbar	O ₂ mbar	C ₅ H ₈ vol. %	N ₂ vol. %	O ₂ vol. %		
40	T11130723	40	1.014	30	872	112	3.0	86.0	11.0	Non-Explosion	1.08
41	T11130724	40	1.014	30	872	112	3.0	86.0	11.0	Non-Explosion	1.05
42	T11130725	40	1.014	30	872	112	3.0	86.0	11.0	Non-Explosion	1.05
43	T11130726	40	1.014	15	887	112	1.5	87.5	11.0	Non-Explosion	<1.02
44	T11130727	40	1.014	15	887	112	1.5	87.5	11.0	Non-Explosion	<1.02
45	T11140700	40	1.014	16	886	112	1.6	87.4	11.0	Non-Explosion	<1.02
46	T11140701	40	1.014	17	885	112	1.7	87.3	11.0	Explosion	1.81
47	T11140702	40	1.014	16	886	112	1.6	87.4	11.0	Explosion	1.54
48	T11140703	40	1.014	15	887	112	1.5	87.5	11.0	Non-Explosion	<1.02
49	T11140704	40	1.015	20	899	96	2.0	88.6	9.5	Non-Explosion	1.05
50	T11140705	40	1.014	20	898	96	2.0	88.6	9.5	Non-Explosion	1.05
51	T11140706	40	1.014	23	890	101	2.3	87.8	10.0	Non-Explosion	1.05
52	T11140707	40	1.015	23	886	106	2.3	87.3	10.4	Explosion	1.19
53	T11140708	40	1.014	25	884	105	2.5	87.2	10.4	Explosion	1.09
54	T11140709	40	1.014	26	883	105	2.6	87.1	10.4	Non-Explosion	1.05
55	T11140710	40	1.014	26	883	105	2.6	87.1	10.4	Non-Explosion	1.06
56	T11140711	40	1.014	26	883	105	2.6	87.1	10.4	Non-Explosion	1.07
57	T11140712	40	1.014	20	889	105	2.0	87.7	10.4	Explosion	1.21
58	T11140713	40	1.014	17	892	105	1.7	88.0	10.4	Non-Explosion	1.04
59	T11140714	40	1.014	18	891	105	1.8	87.9	10.4	Explosion	1.21
60	T11140715	40	1.014	17	892	105	1.7	88.0	10.4	Non-Explosion	1.03
61	T11140716	40	1.014	17	892	105	1.7	88.0	10.4	Non-Explosion	1.03
62	T11140717	40	1.014	21	890	103	2.1	87.8	10.2	Explosion	1.1
63	T11140718	40	1.014	21	891	102	2.1	87.9	10.1	Explosion	1.09
64	T11140719	40	1.014	21	892	101	2.1	88.0	10.0	Explosion	1.09
65	T11140720	40	1.014	22	891	101	2.2	87.9	10.0	Explosion	1.1
66	T11140721	40	1.014	23	890	101	2.3	87.8	10.0	Non-Explosion	1.06
67	T11140722	40	1.014	23	890	101	2.3	87.8	10.0	Non-Explosion	1.08
68	T11140723	40	1.014	19	894	101	1.9	88.2	10.0	Explosion	1.12
69	T11140724	40	1.014	18	895	101	1.8	88.3	10.0	Non-Explosion	1.06
70	T11140725	40	1.014	19	895	101	1.8	88.3	10.0	Non-Explosion	1.03
71	T11140726	40	1.014	18	895	101	1.8	88.3	10.0	Non-Explosion	1.04
72	T11140727	40	1.014	20	895	99	2.0	88.3	9.8	Non-Explosion	1.08
73	T11140728	40	1.014	20	895	99	2.0	88.3	9.8	Explosion	1.1
74	T11140729	40	1.014	20	896	98	2.0	88.4	9.7	Non-Explosion	1.06
75	T11140730	40	1.014	20	896	98	2.0	88.4	9.7	Non-Explosion	1.08
76	T11140731	40	1.014	20	896	98	2.0	88.4	9.7	Non-Explosion	1.07
77	T11140732	40	1.014	81	781	172	8.0	75.0	17.0	Non-Explosion	1.04
78	T11140733	40	1.014	81	750	183	8.0	74.0	18.0	Explosion	1.3
79	T11140734	40	1.014	81	754	179	8.0	74.4	17.7	Explosion	1.24
80	T11140735	40	1.014	81	757	176	8.0	74.7	17.4	Non-Explosion	1.03
81	T11140736	40	1.014	81	755	178	8.0	74.5	17.6	Non-Explosion	1.05
82	T11140737	40	1.014	81	755	178	8.0	74.5	17.6	Non-Explosion	1.03
83	T11140738	40	1.014	81	755	178	8.0	74.5	17.6	Non-Explosion	1.03

Figure 81

TEST SERIES 2

Test	Data File Name	Temp °C	Initial Pressure bara	Partial Pressures				Concentrations				Result	Pex bara
				H ₂ O mbar	C ₅ H ₈ mbar	N ₂ mbar	O ₂ mbar	H ₂ O vol. %	C ₅ H ₈ vol. %	N ₂ vol. %	O ₂ vol. %		
1	T11150700	40	1.014	41	119	641	213	4.0	11.7	63.2	21.0	Explosion	1.33
2	T11150701	40	1.014	40	121	640	213	3.9	11.9	63.1	21.0	Non-explosion	1.07
3	T11150702	40	1.014	41	120	640	213	4.0	11.8	63.1	21.0	Explosion	1.09
4	T11150703	40	1.014	40	121	640	213	3.9	11.9	63.1	21.0	Non-explosion	1.06
5	T11150704	40	1.014	40	120	641	213	3.9	11.8	63.2	21.0	Explosion	1.09
6	T11150705	40	1.014	40	121	640	213	3.9	11.9	63.1	21.0	Non-explosion	1.06
7	T11150706	40	1.014	40	15	746	213	3.9	1.5	73.6	21.0	Explosion	4.68
8	T11150707	40	1.014	41	15	746	213	4.0	1.5	73.5	21.0	Explosion	5.27
9	T11150708	40	1.014	41	14	746	213	4.0	1.4	73.5	21.0	Non-explosion	1.03
10	T11150709	40	1.014	42	14	745	213	4.1	1.4	73.5	21.0	Non-explosion	1.03
11	T11160700	40	1.014	41	14	746	213	4.0	1.4	73.6	21.0	Non-explosion	1.03
12	T11160701	40	1.014	41	20	850	103	4.0	2.0	83.8	10.2	Explosion	1.11
13	T11160702	40	1.014	41	20	851	102	4.0	2.0	83.9	10.1	Explosion	1.11
14	T11160703	40	1.014	41	20	852	101	4.0	2.0	84.0	10.0	Explosion	1.09
15	T11160704	40	1.014	41	20	853	100	4.0	2.0	84.1	9.9	Explosion	1.09
16	T11160705	40	1.014	41	20	854	99	4.0	2.0	84.2	9.8	Non-explosion	1.07
17	T11160706	40	1.014	40	20	855	99	3.9	2.0	84.3	9.8	Non-explosion	1.06
18	T11160707	40	1.014	41	20	854	99	4.0	2.0	84.2	9.8	Non-explosion	1.08

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Figure 82

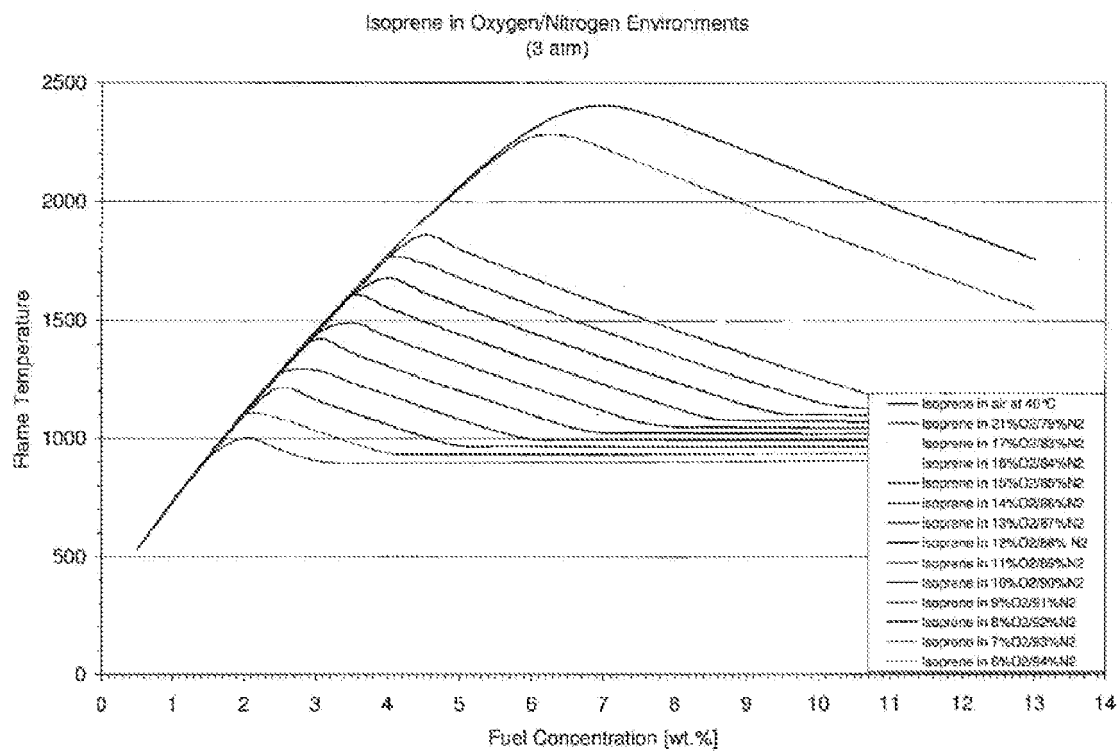
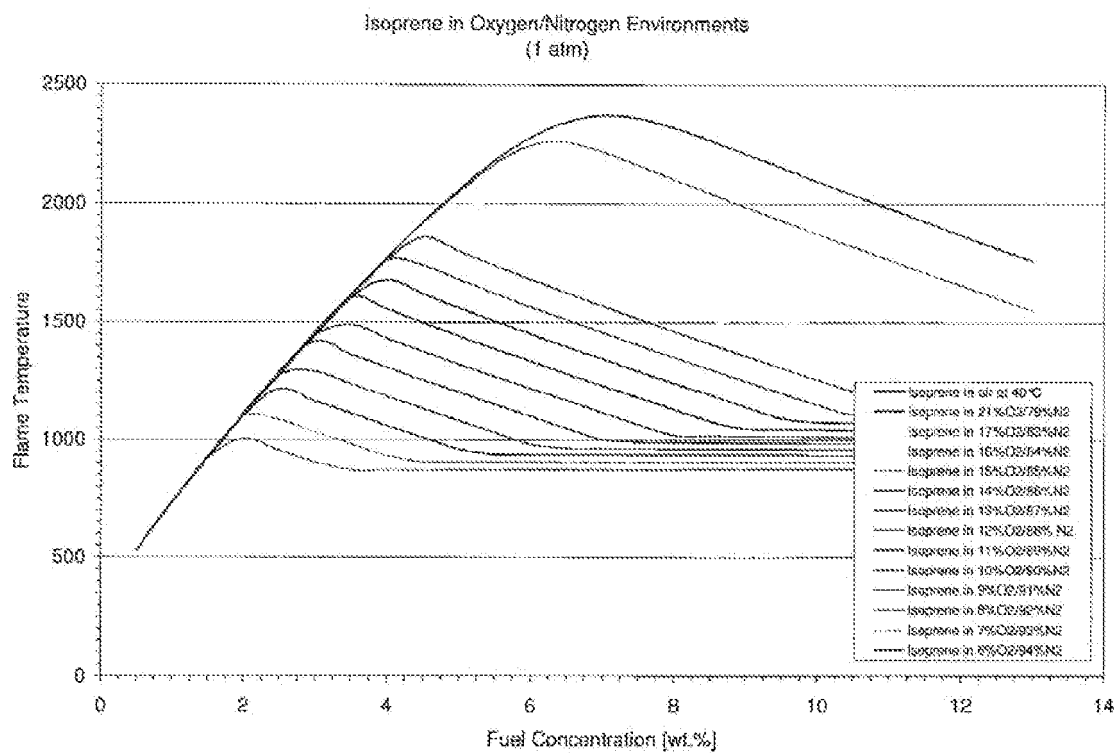
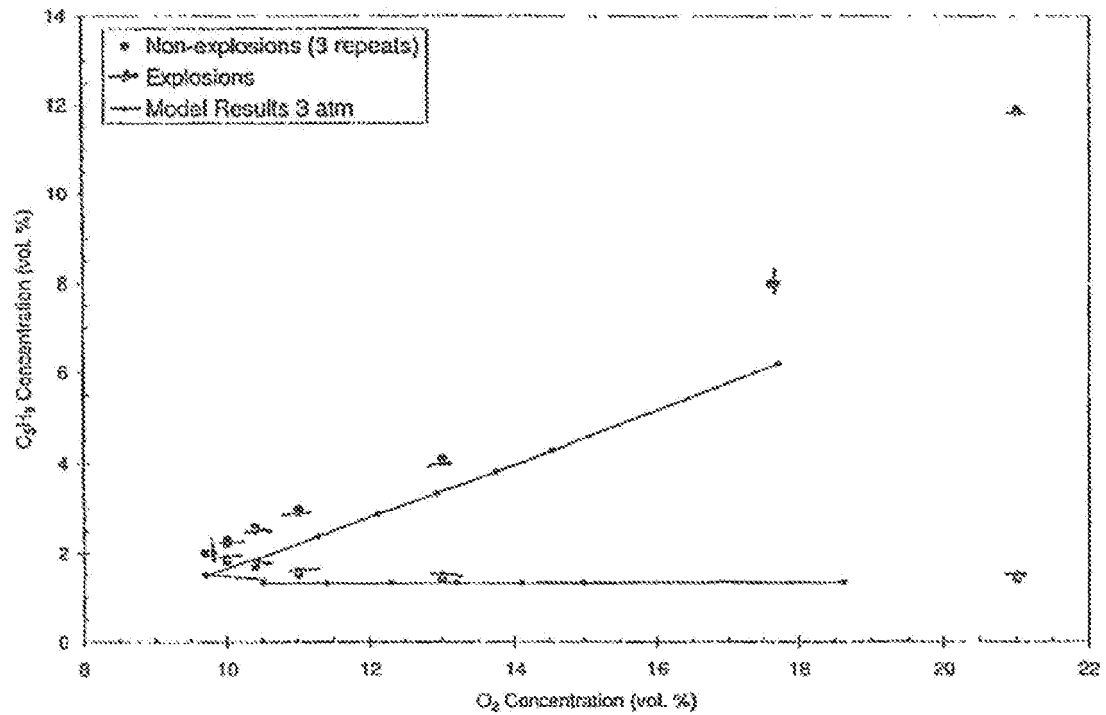


Figure 83



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Figure 84



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Figure 85

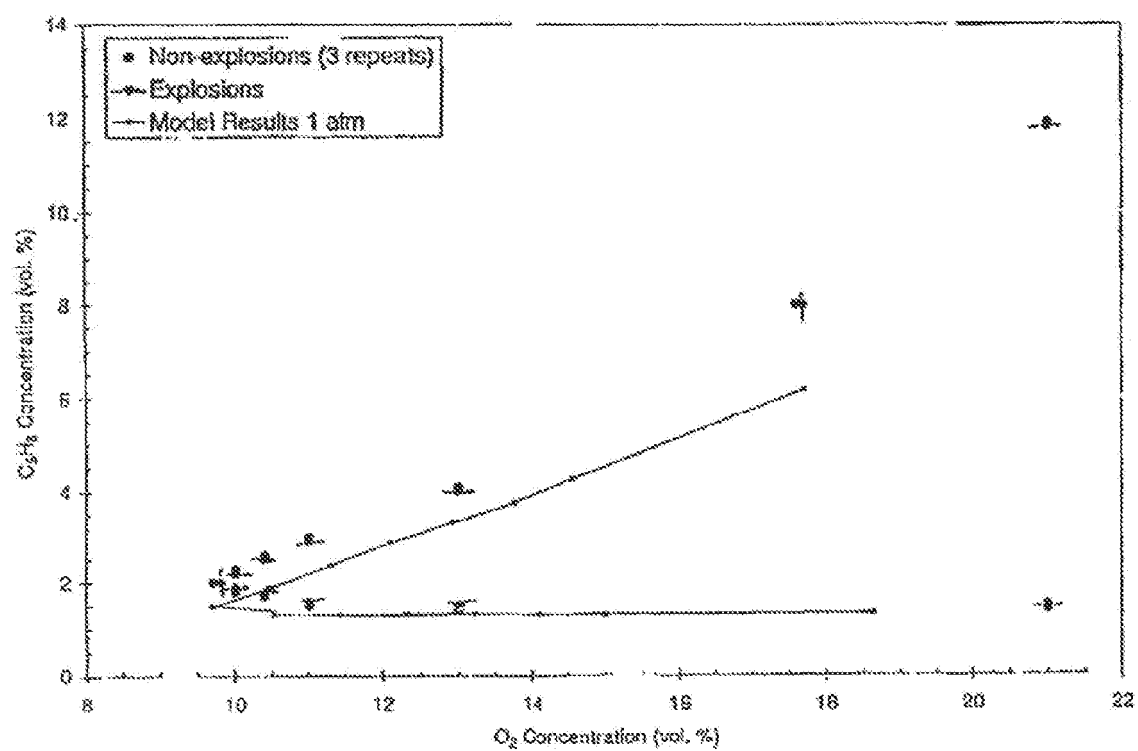


Figure 86A

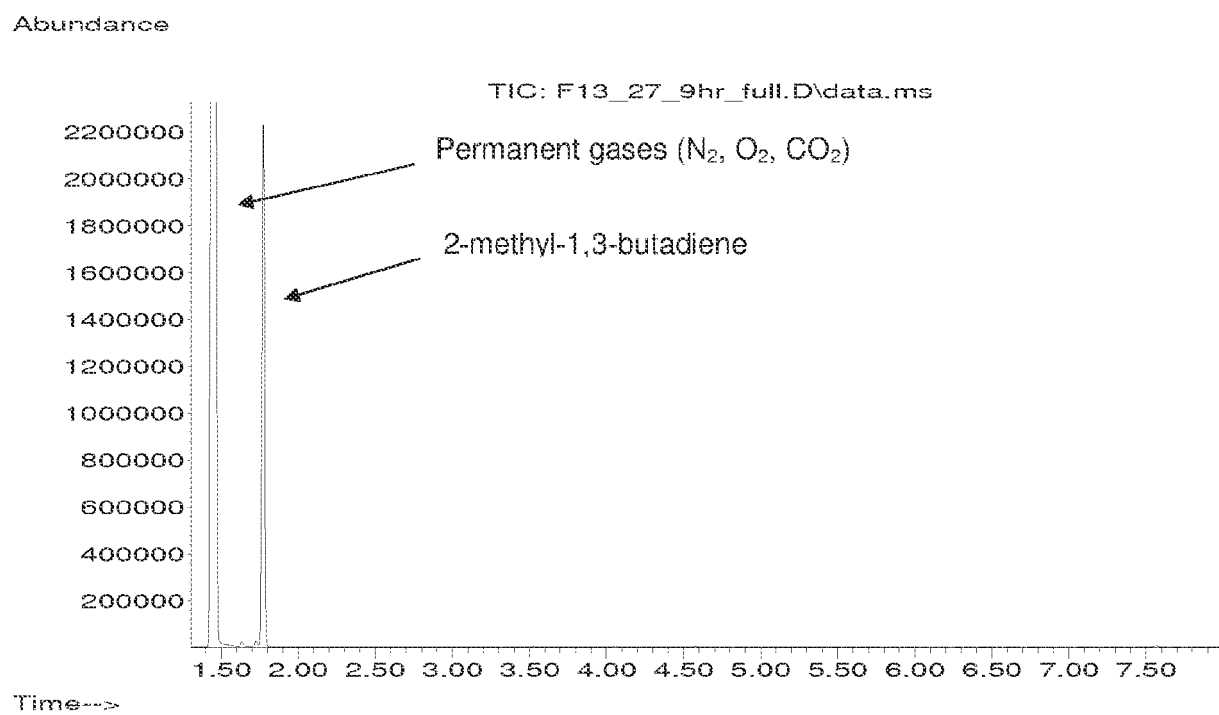
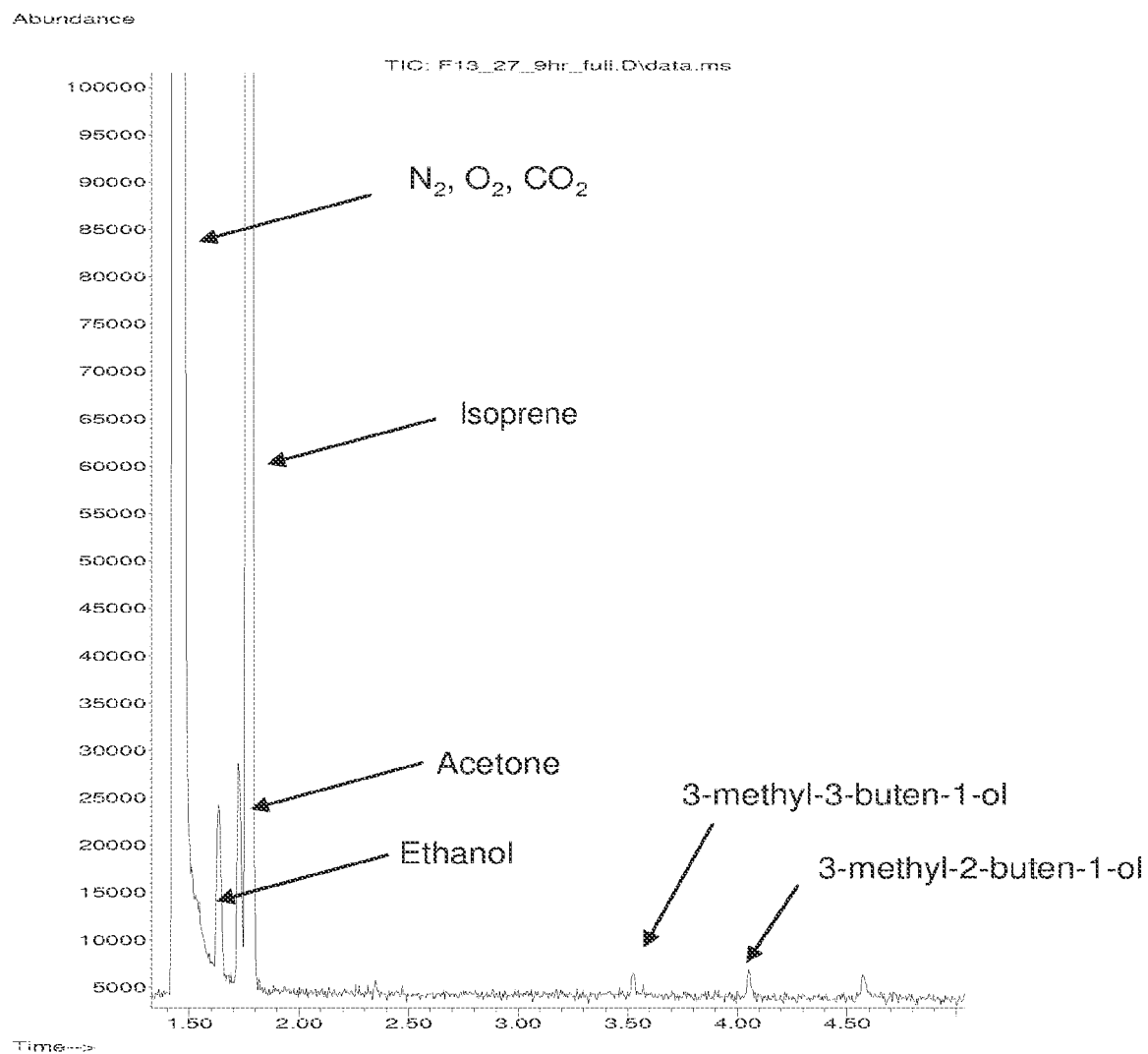


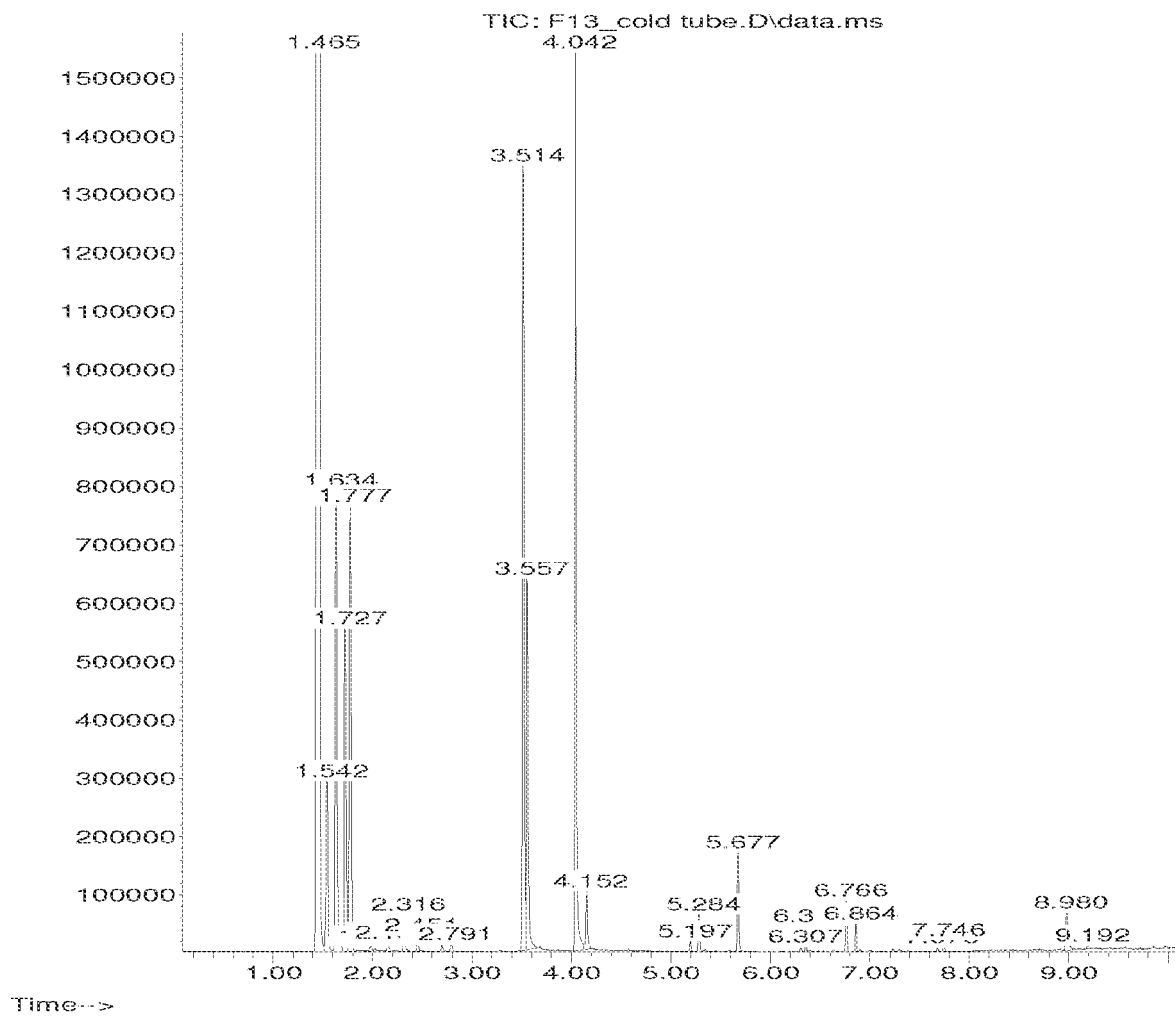
Figure 86B



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Figure 87A

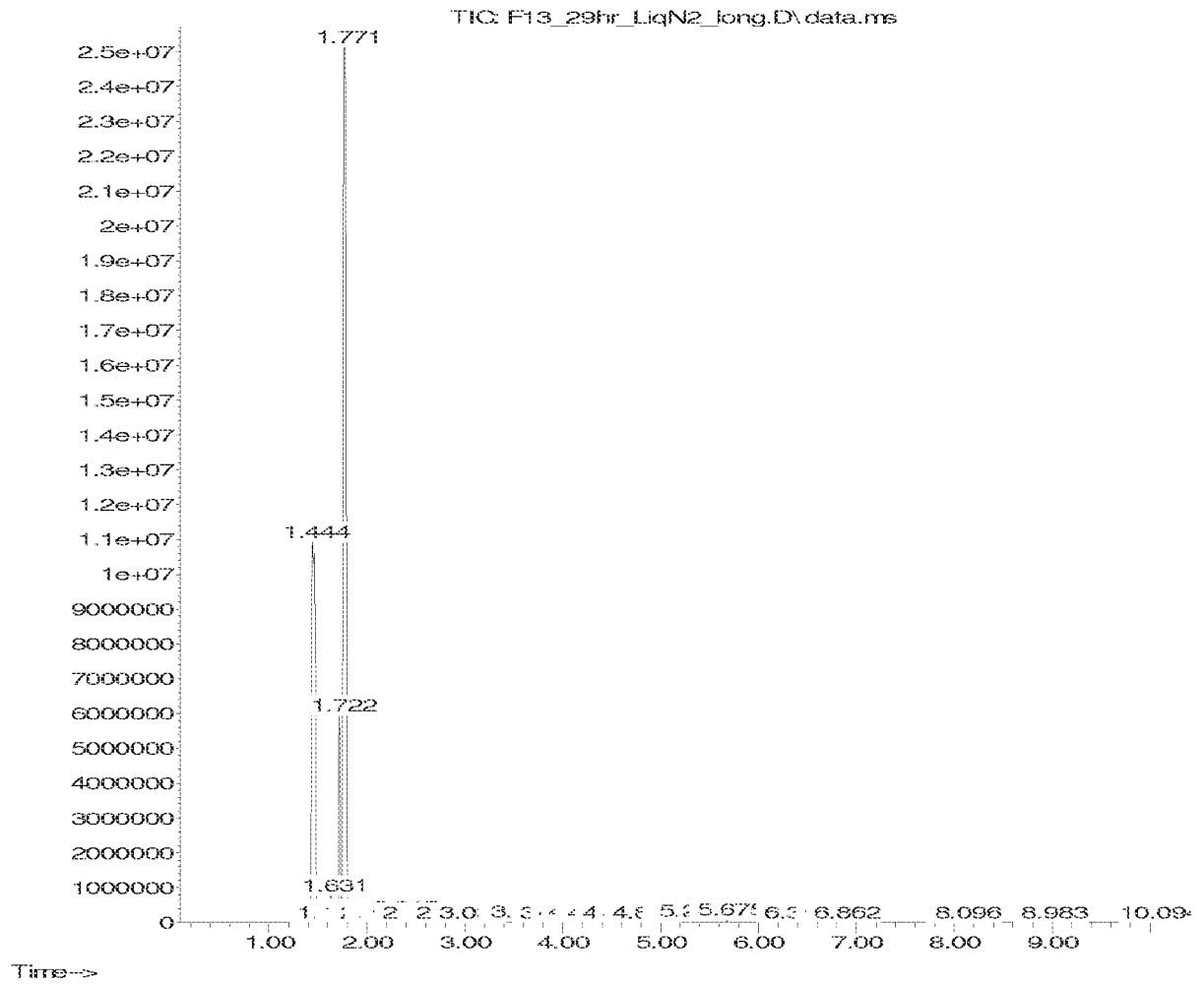
Abundance



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Figure 87B

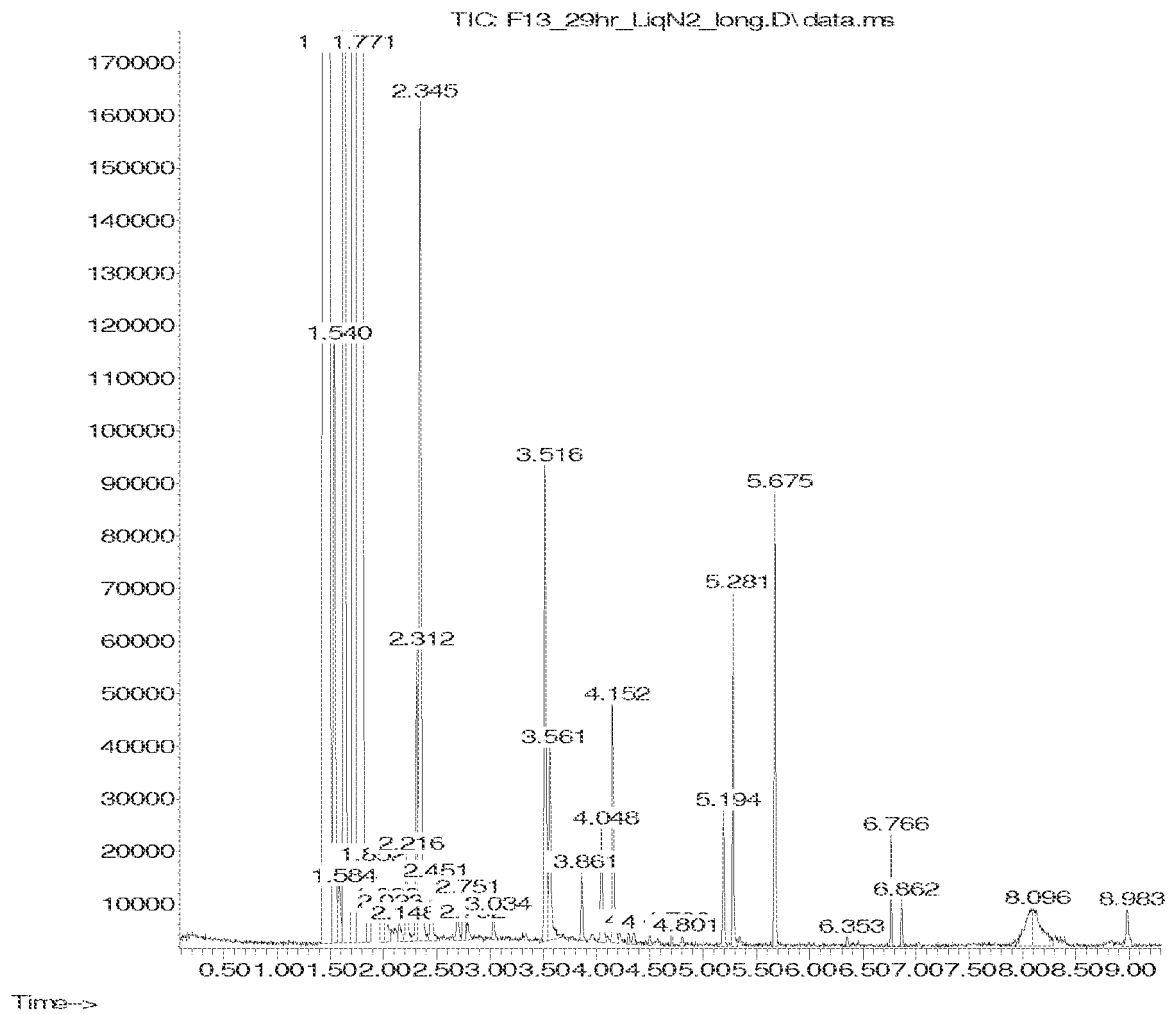
Abundance



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Figure 87C

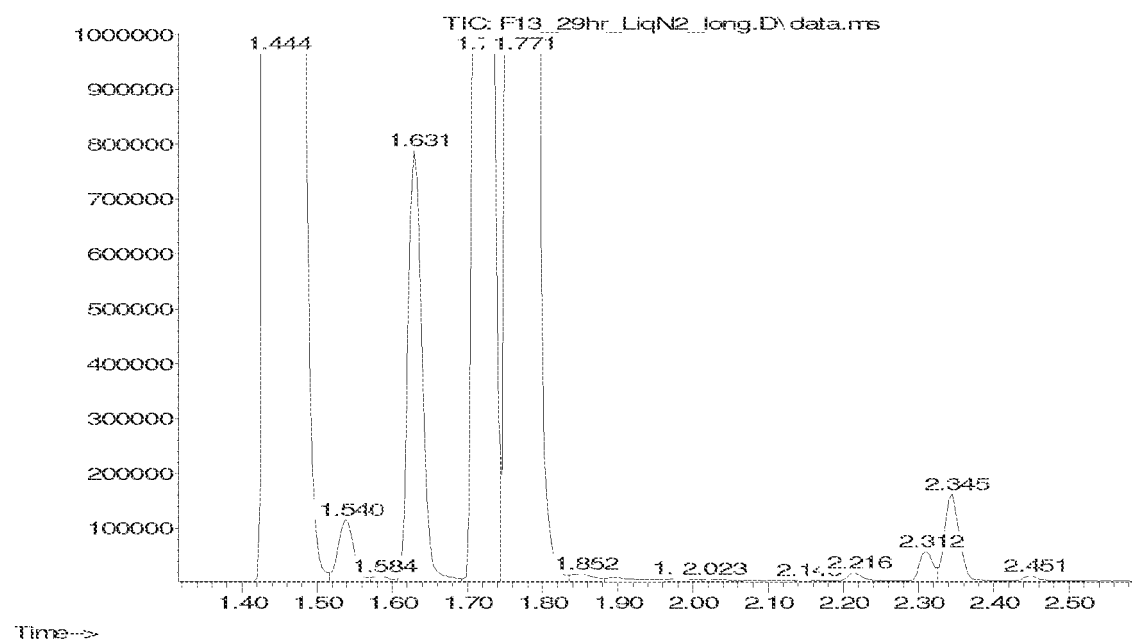
Abundance



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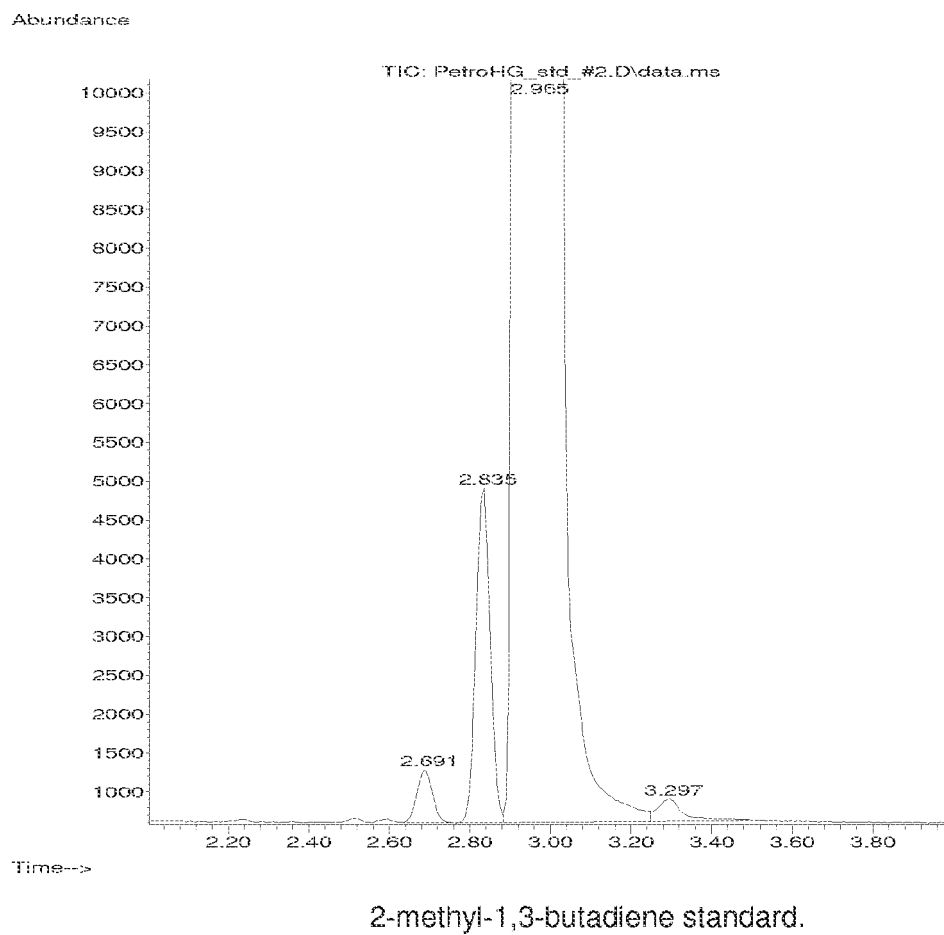
Figure 87D

Abundance

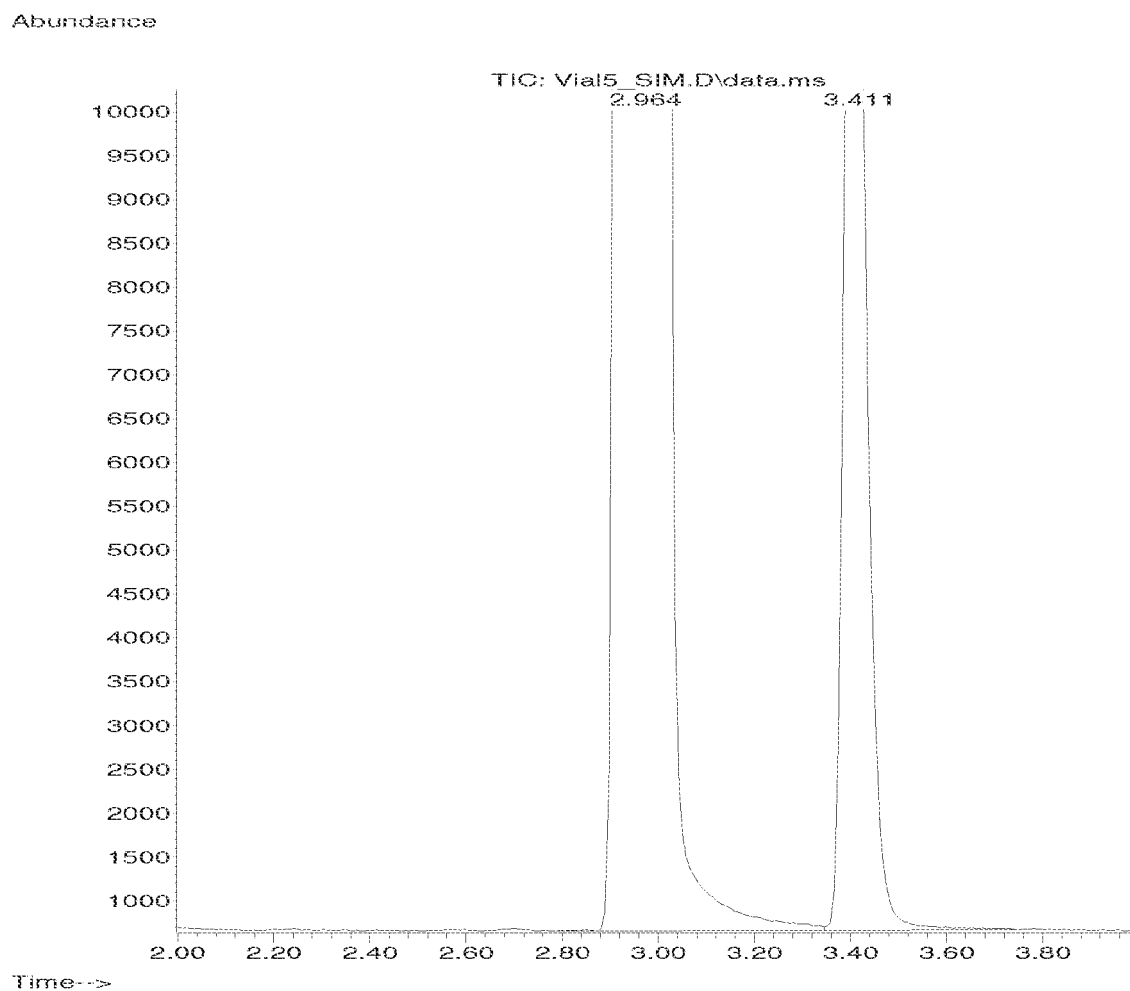


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Figure 88A



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Figure 88B

2-methyl-1,3-butadiene from recombinant *E. coli*

Figure 89

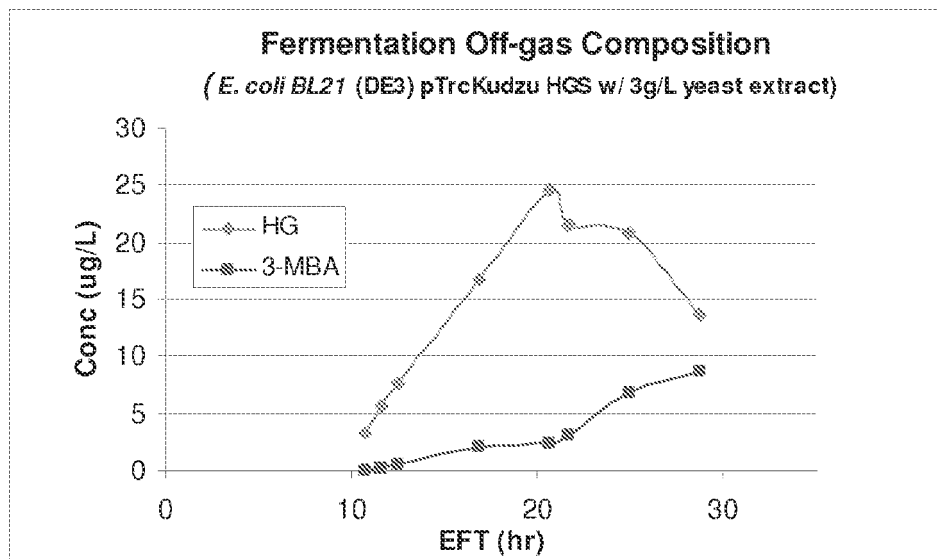
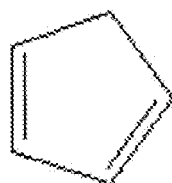
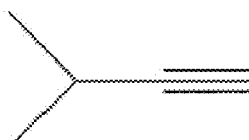


Figure 90



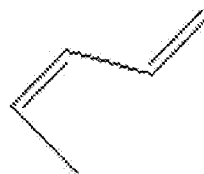
cyclopentadiene



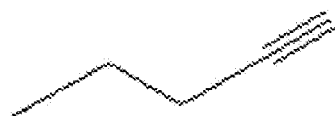
"isopryne" = 3-Me-1-butyne



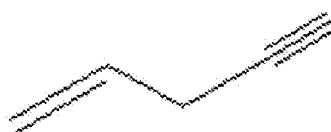
trans-piperylene



cis-piperylene



1-pentyne



pent-4-ene-1-yne



trans-pent-3-ene-1-yne



cis-pent-3-ene-1-yne

Figure 91

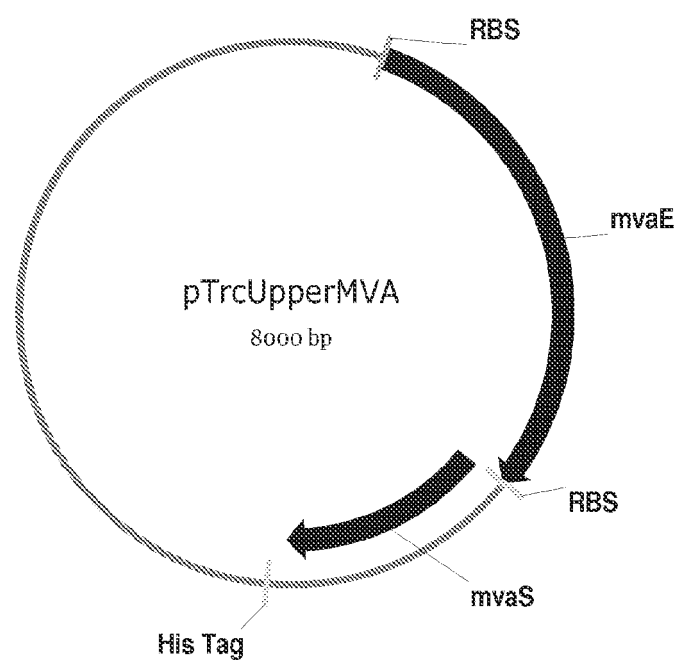


Figure 92A

1-

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Figure 92C

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Figure 93

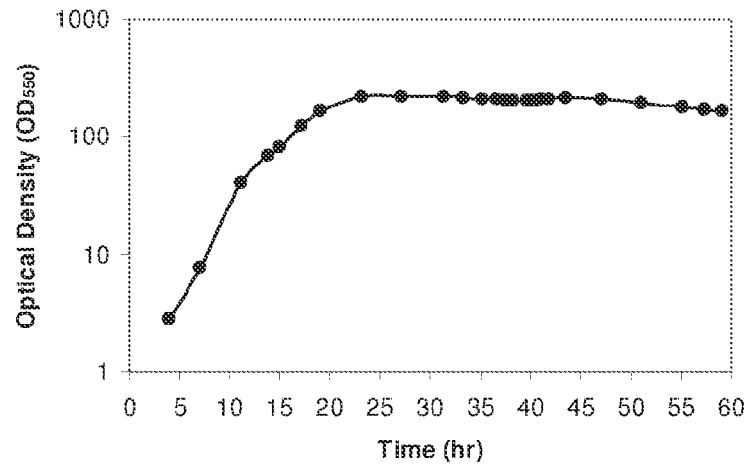
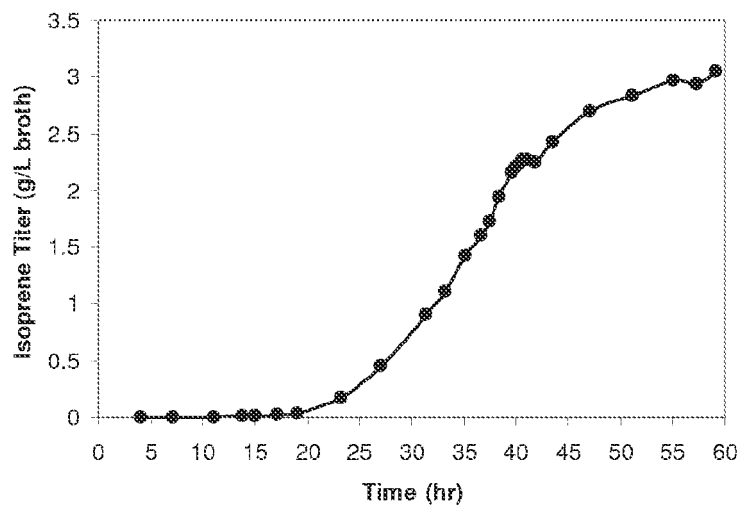


Figure 94



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Figure 95

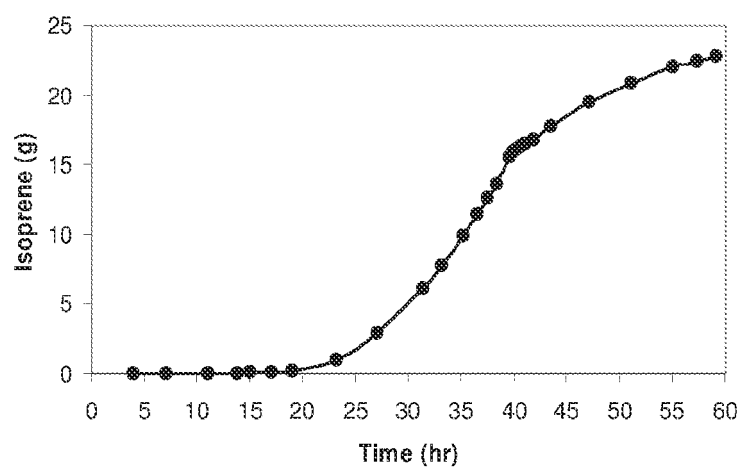


Figure 96A

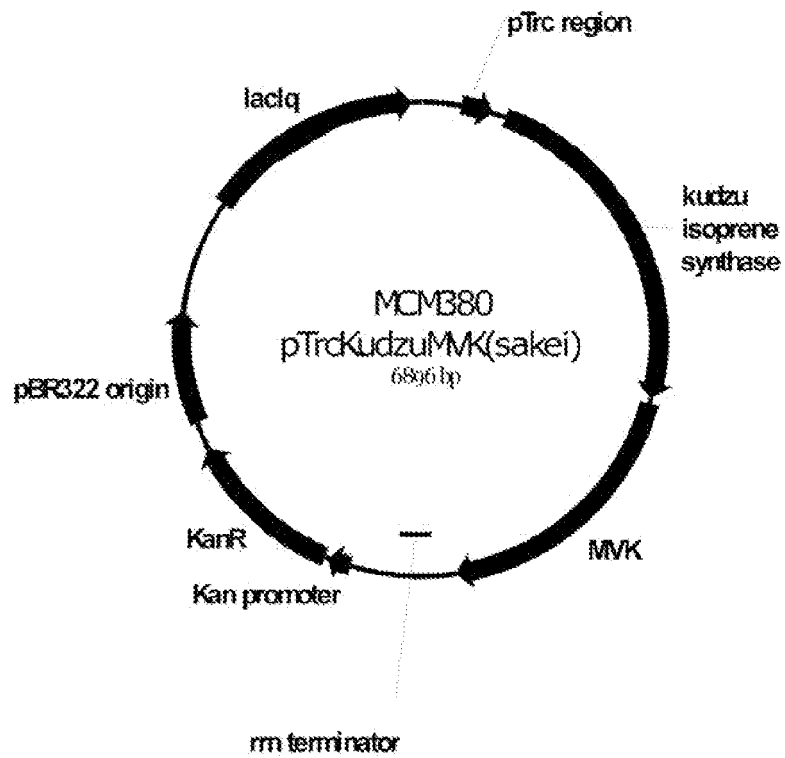


Figure 96C

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Figure 97A

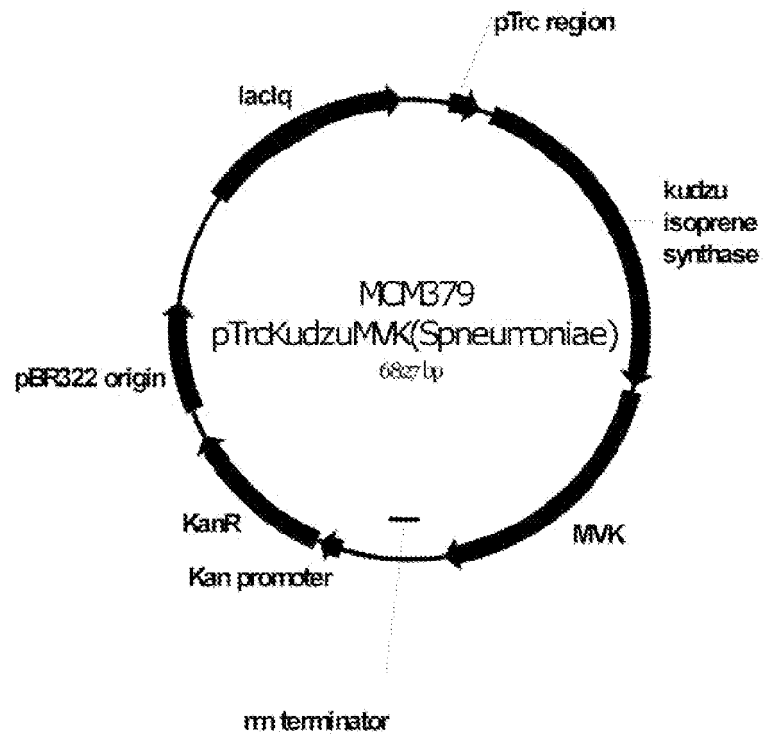


Figure 97C

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Figure 98A

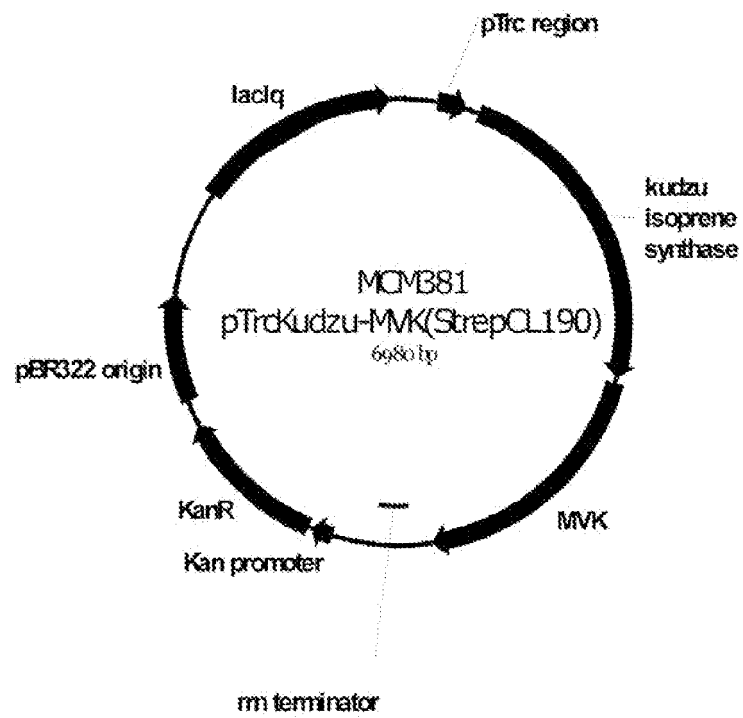


Figure 98B

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Figure 98C

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Figure 99

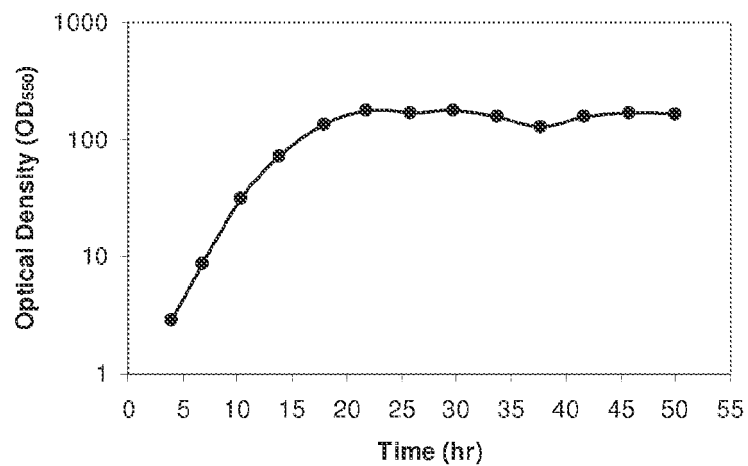
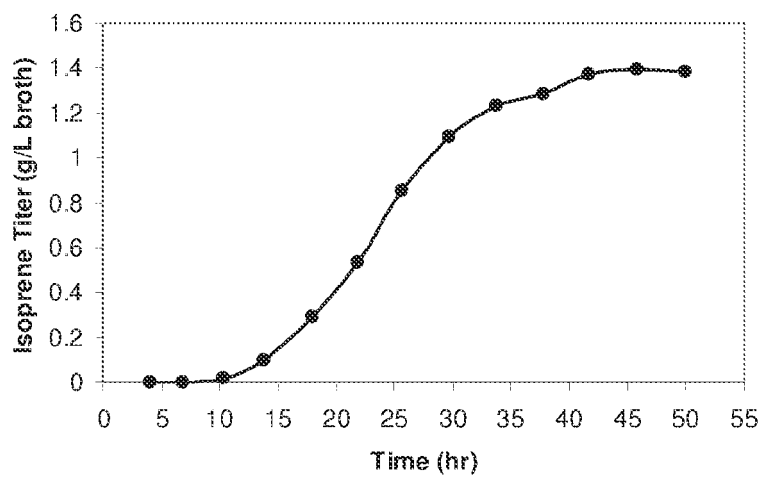


Figure 100



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Figure 101

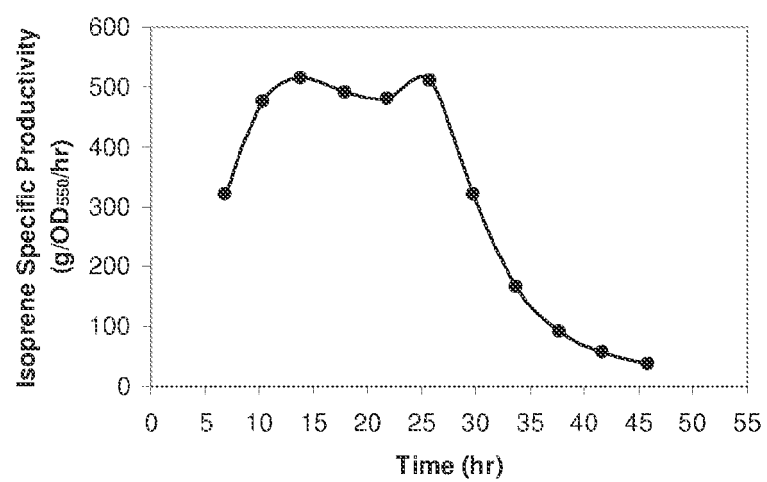


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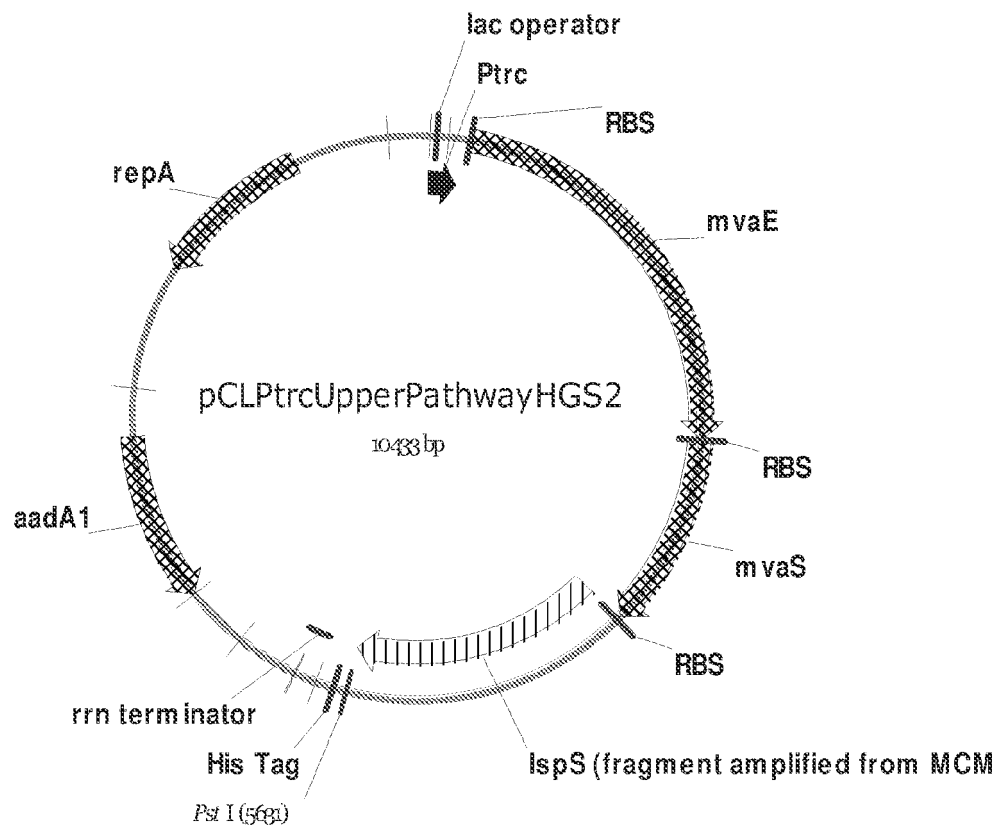


Figure 103A

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Figure 103B

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(SEQ ID NO:87)

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Figure 104

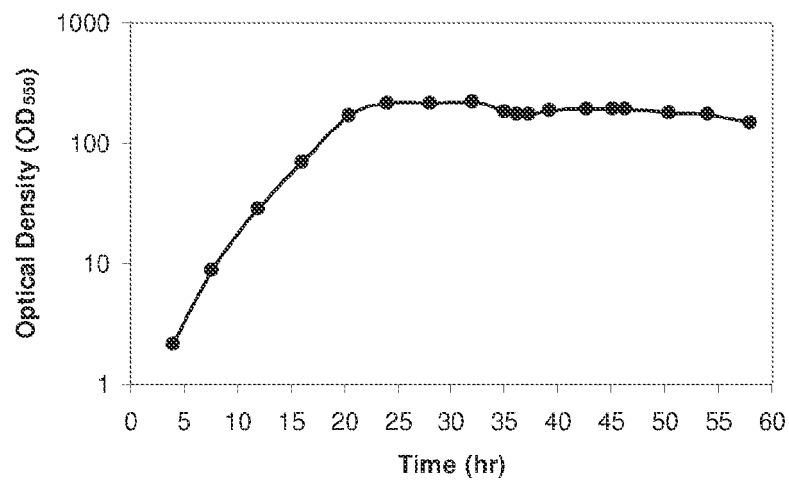
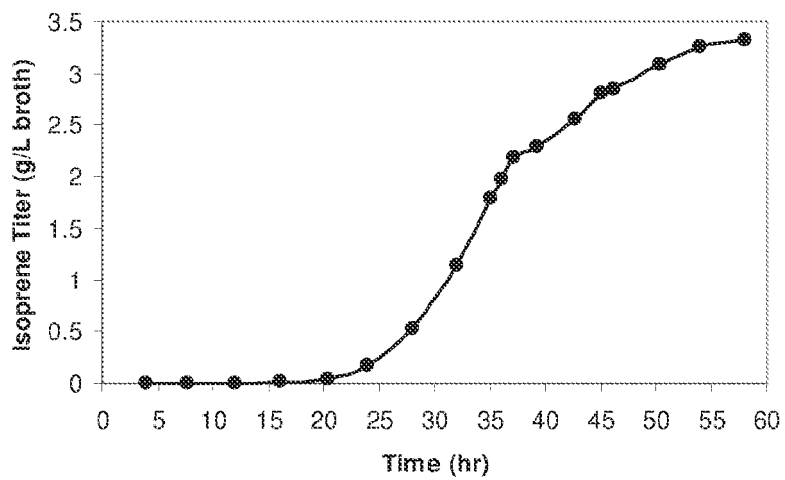


Figure 105



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Figure 106

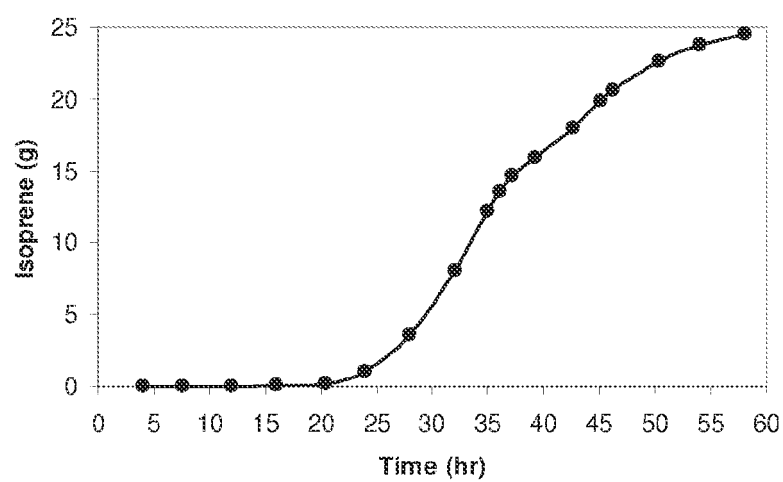
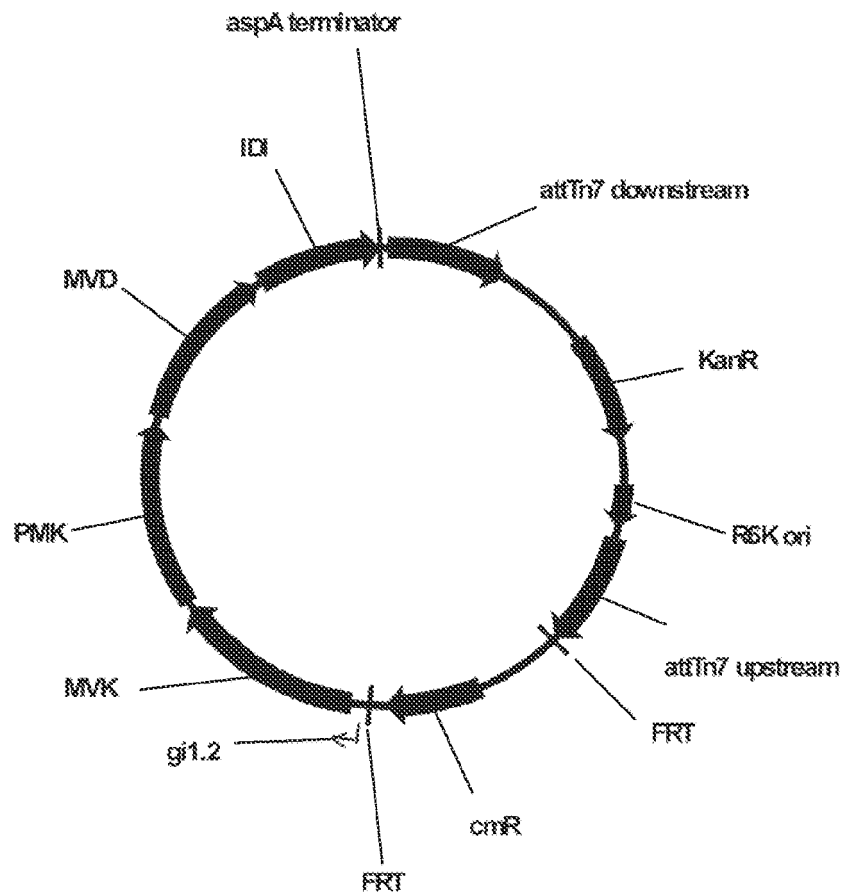


Figure 107



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Figure 108A

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Figure 108C

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Figure 109

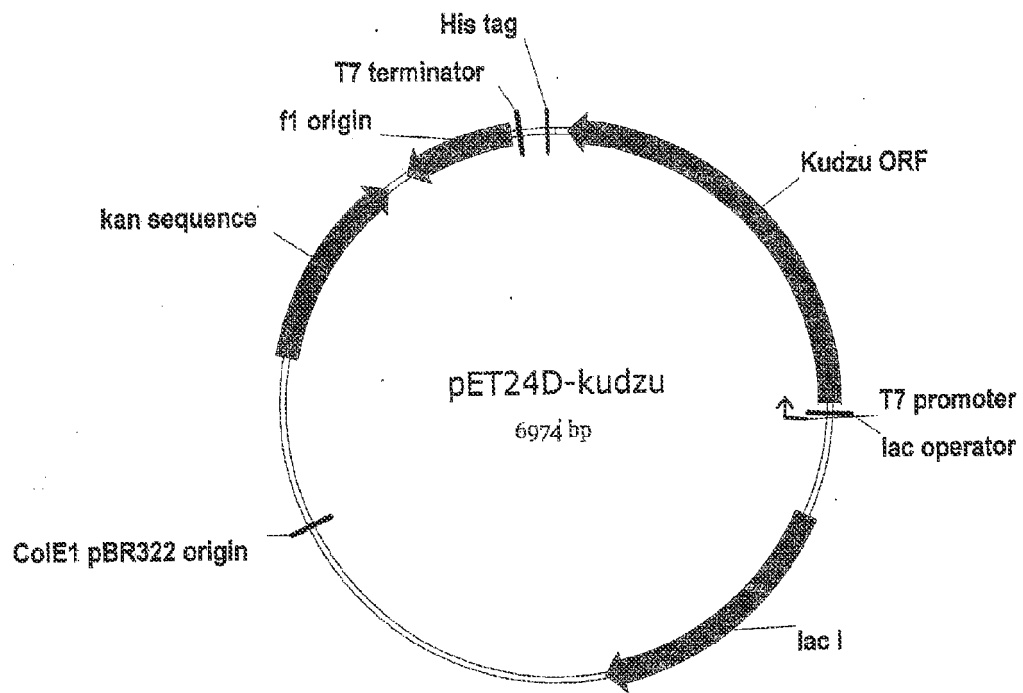


Figure 110A

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Figure 110B

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Figure 111A

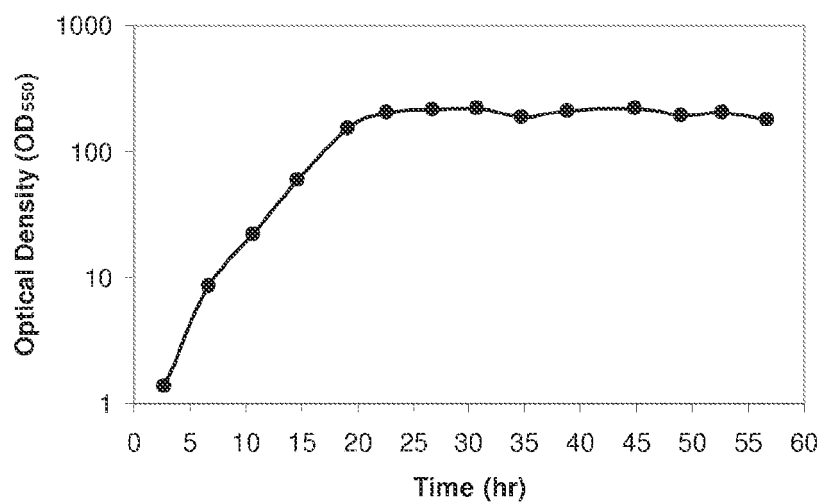
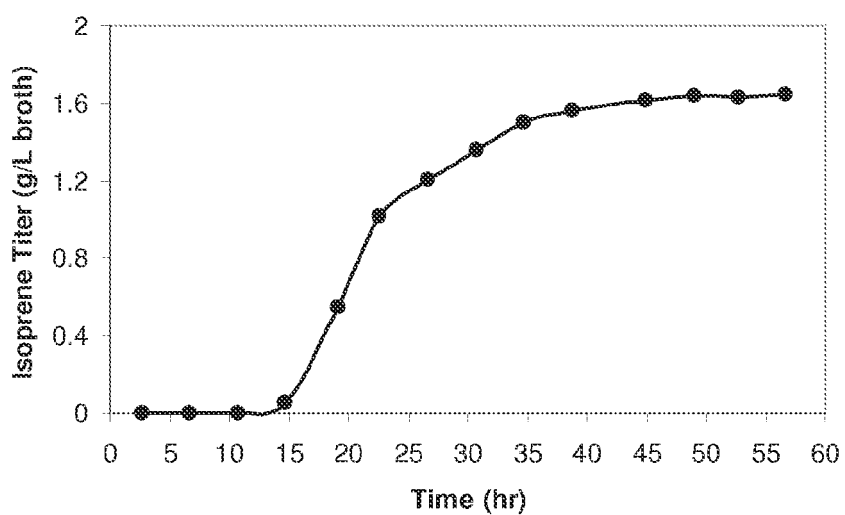


Figure 111B



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Figure 111C

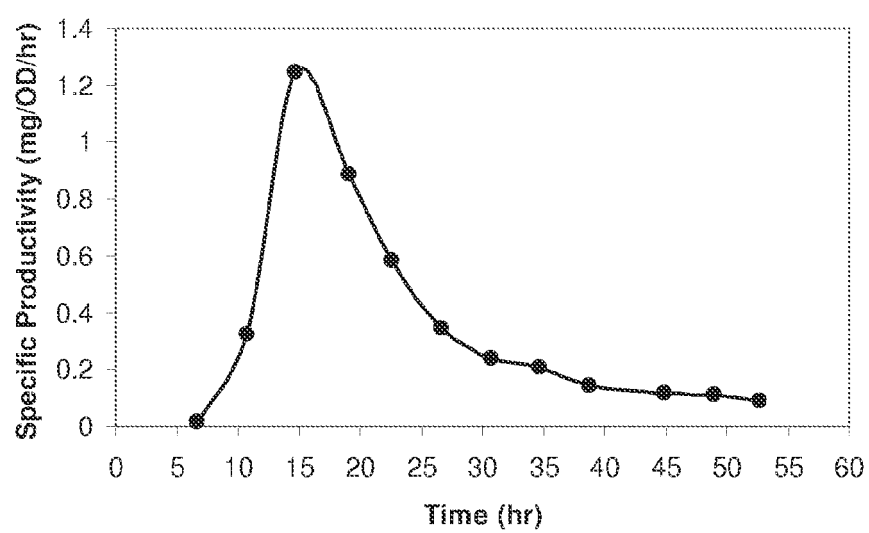
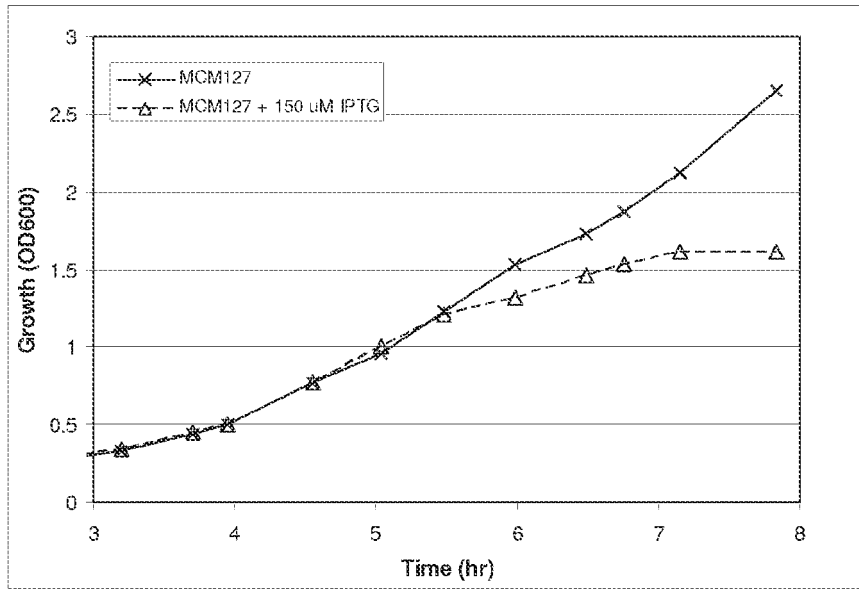


Figure 112A-112B

A



B

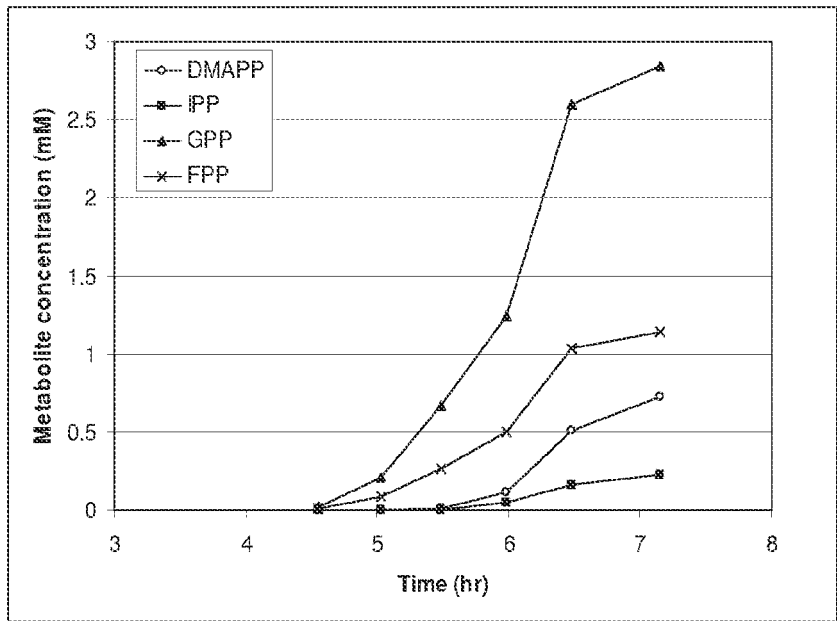
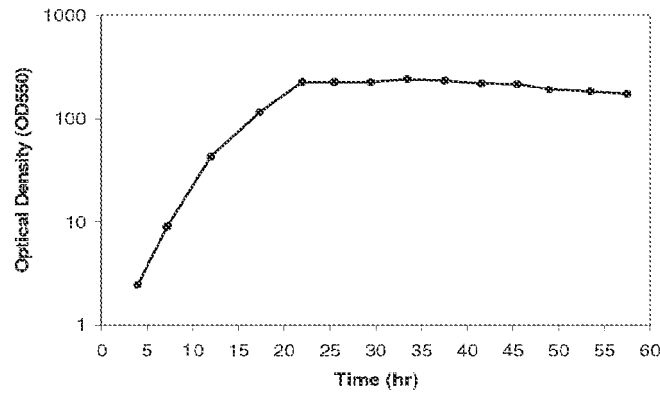
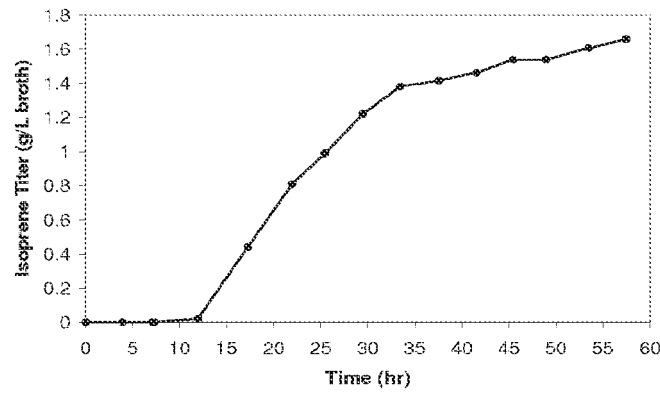


Figure 112C-112E

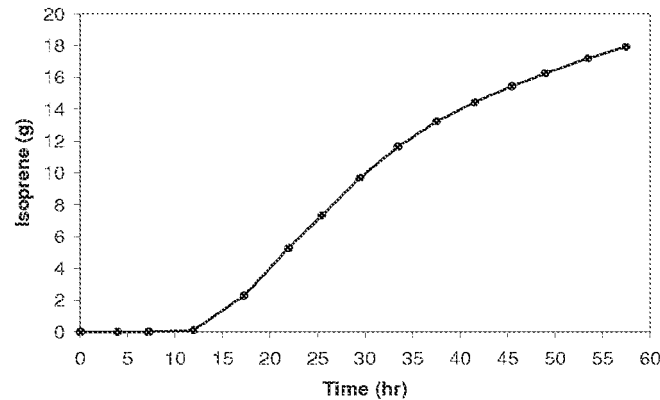
C



D



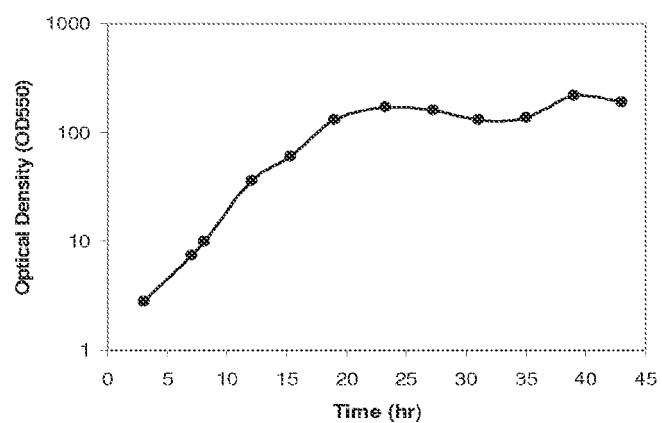
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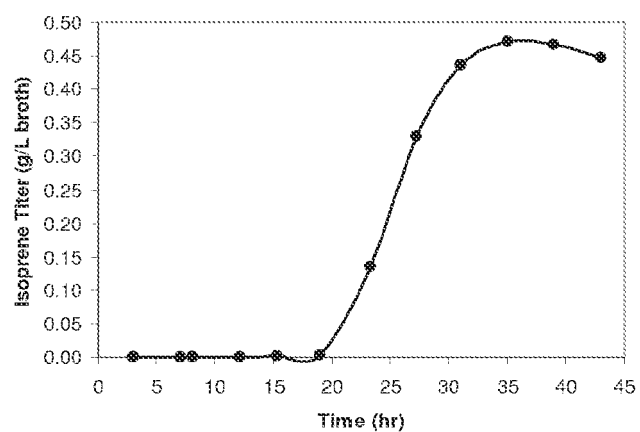
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Figure 112F-112H

F



G



H

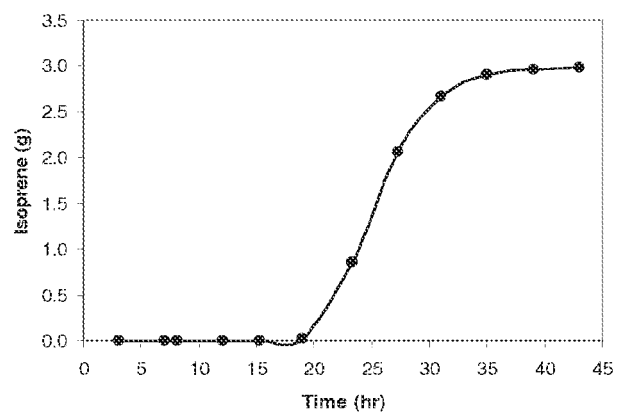
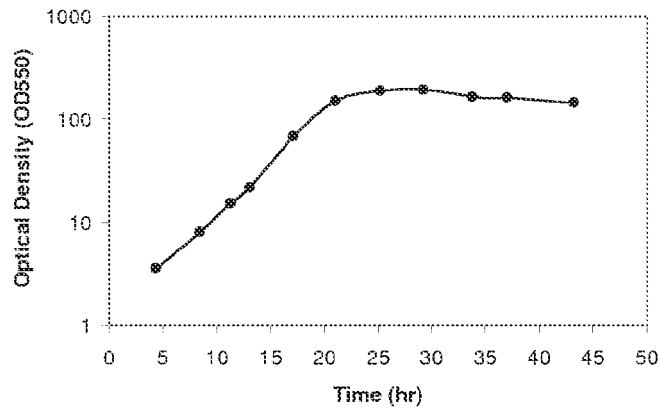
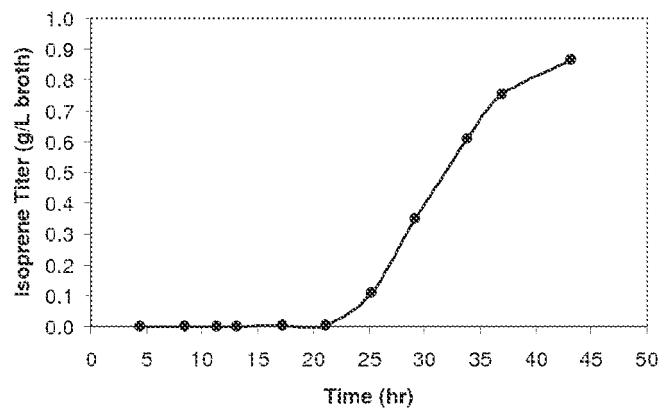


Figure 112I-112K

I



J



K

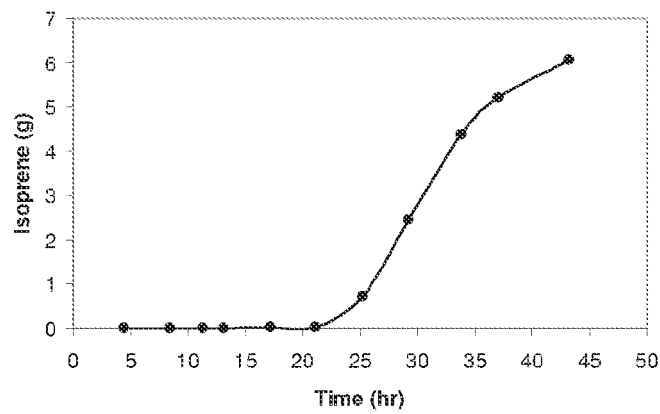


Figure 112L-112N

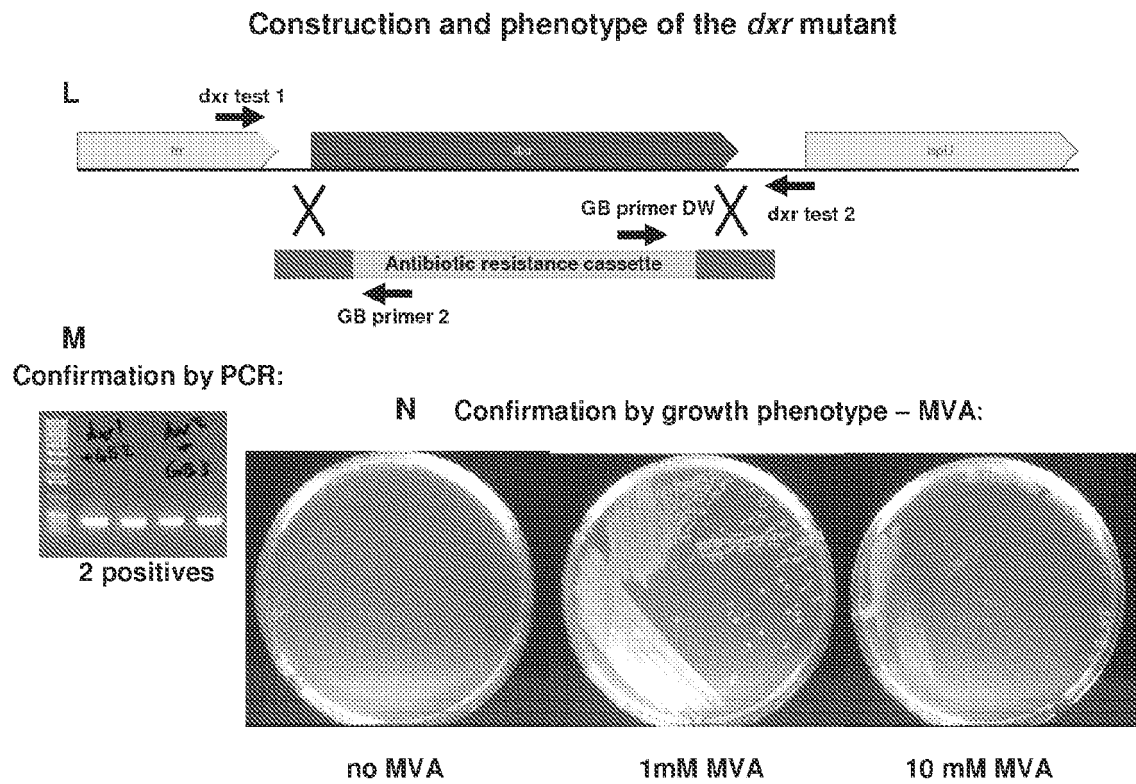


Figure 112O-112P

O

MCM63	P _{trc} minus lacO forw	Tcatccggctcgtataatgtgtggtcacacaggaaacagcgccgctga (SEQ ID NO:139)
MCM64	P _{trc} minus lacO rev	Tcagcggcgctgtttcctgtgtgaccacacattatagagccggatga (SEQ ID NO:140)

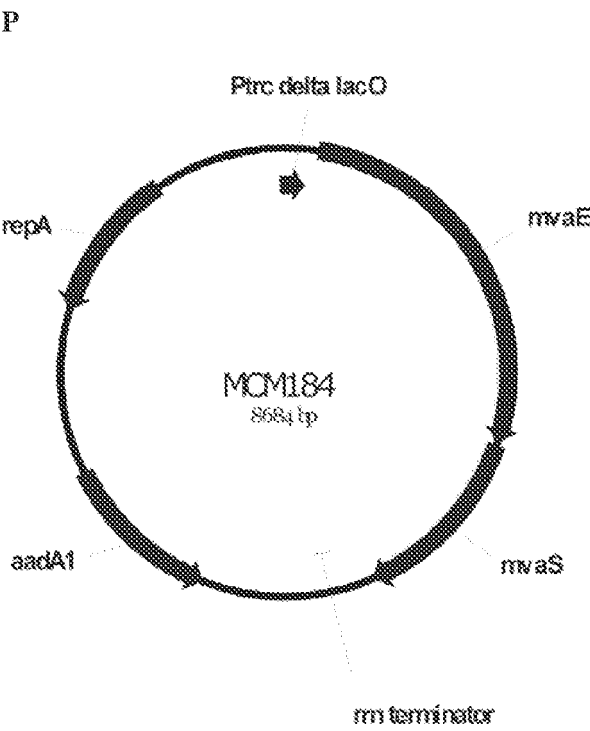


Figure 112Q

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Figure 112S

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Figure 112T-112U**T**

EL-976 : (+) PCR of KKDI insertion into pCL vector (upstream of promoter region)
CTTCTCAGGGCGTTTTATGGC (SEQ ID NO:142)

EL-977 : (-) PCR of KKDI insertion into pCL vector (anneals to MVK gene)
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EL-978 : (+) sequence from yeast IDI towards terminator
GACTGTCAACCCAAACGTCAATG (SEQ ID NO :144)

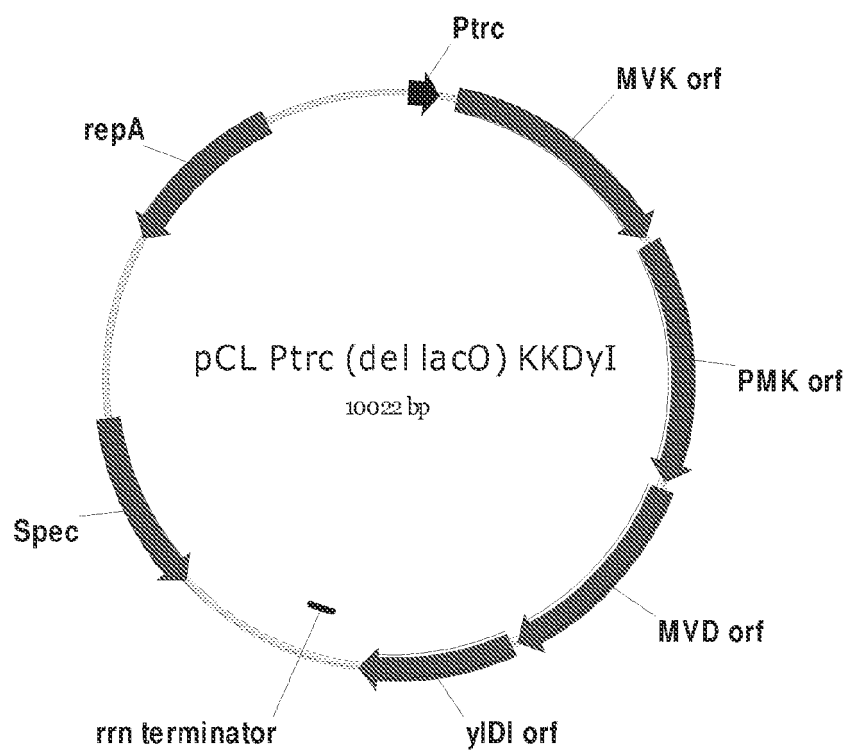
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Figure 112V

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Figure 112W

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Figure 112X

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Figure 113A-113B

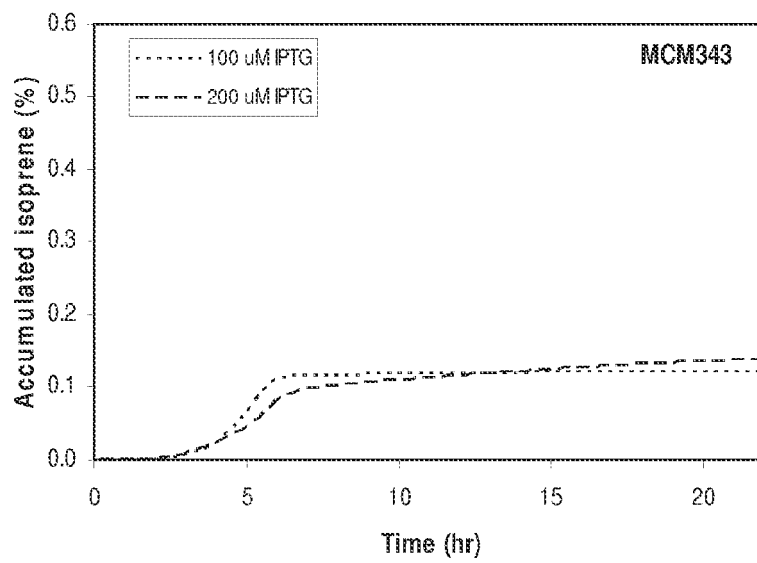
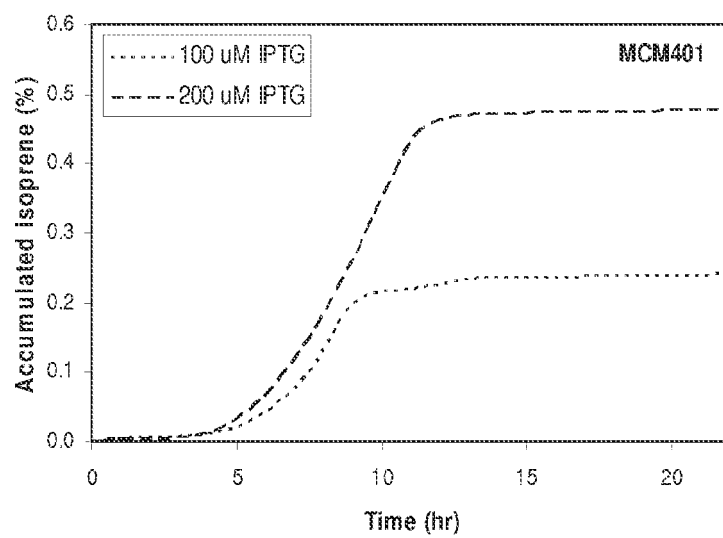
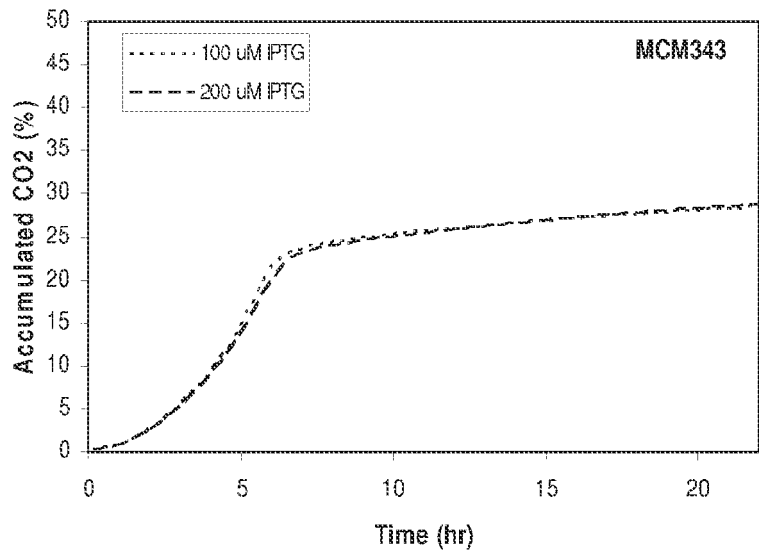
A**B**

Figure 113C-113D

C



D

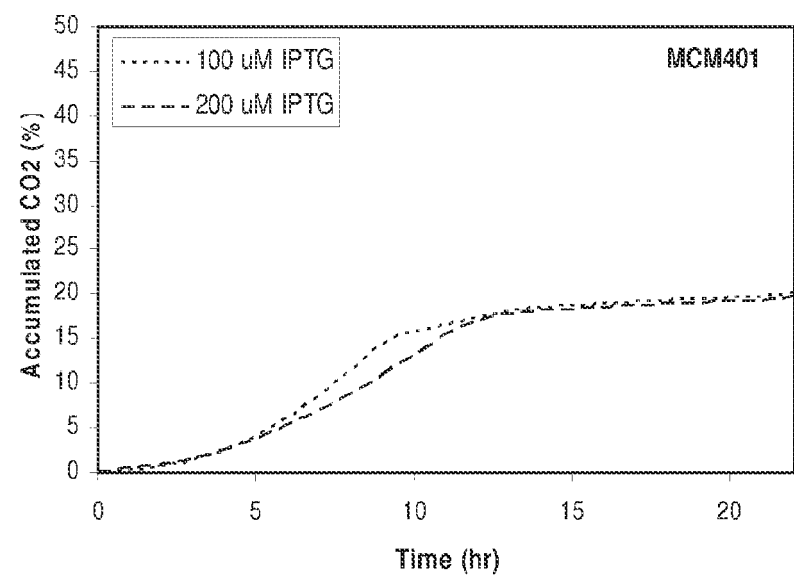


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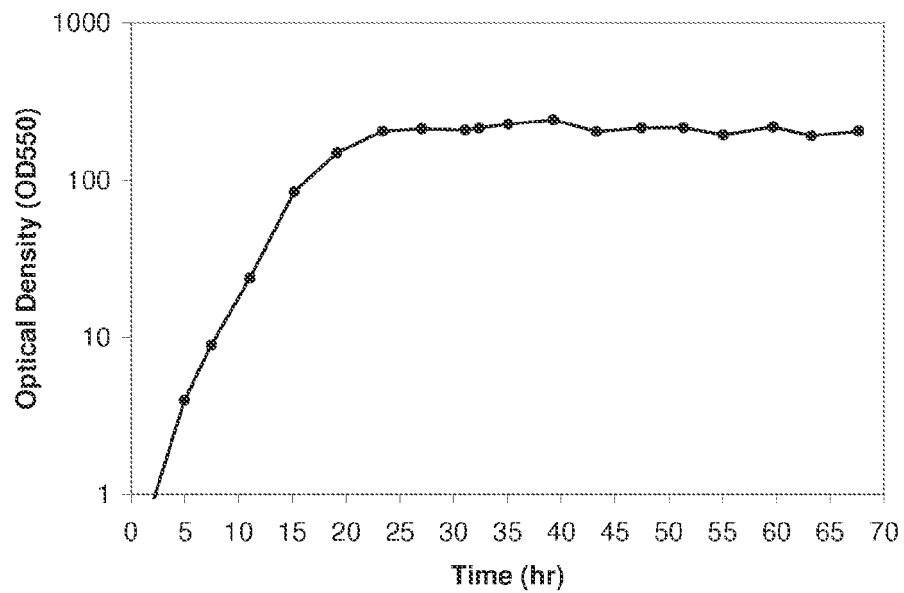


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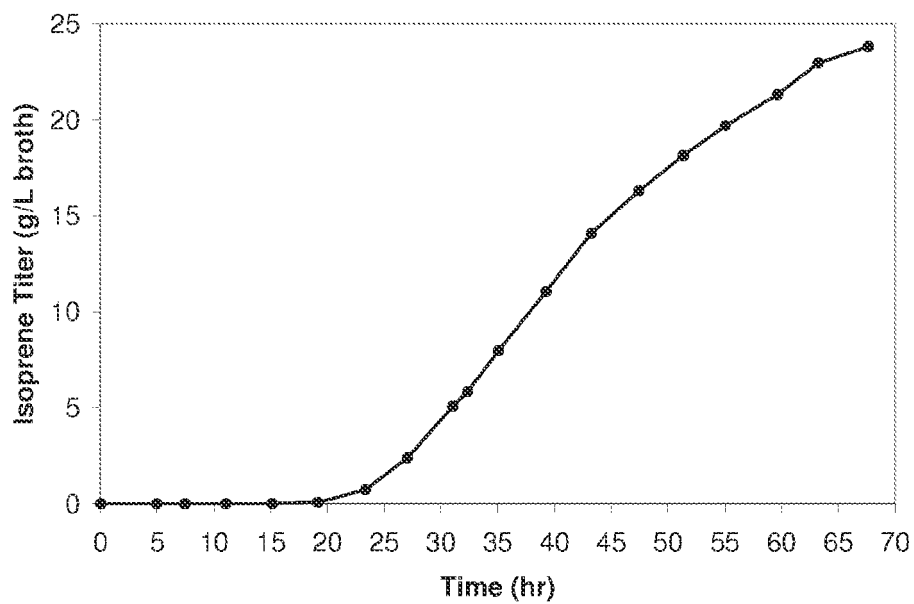


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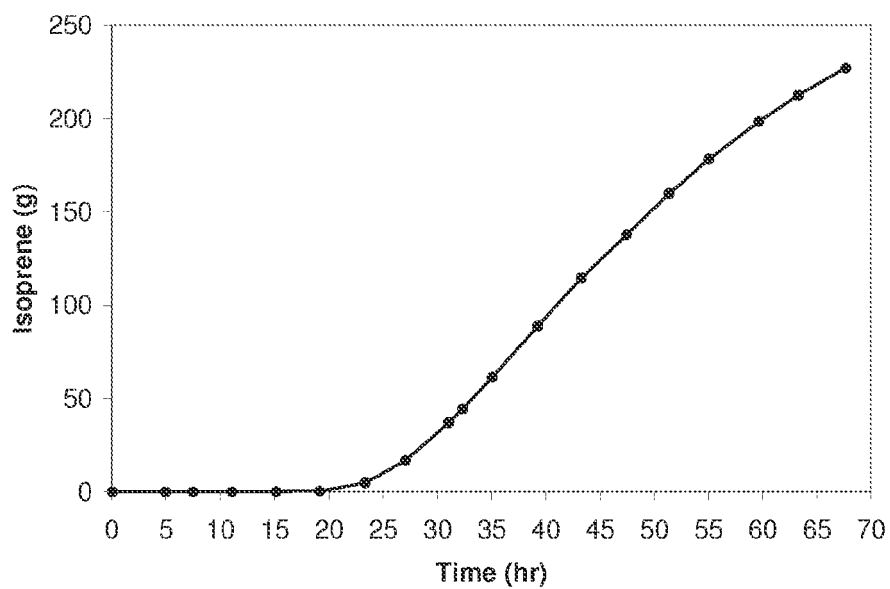
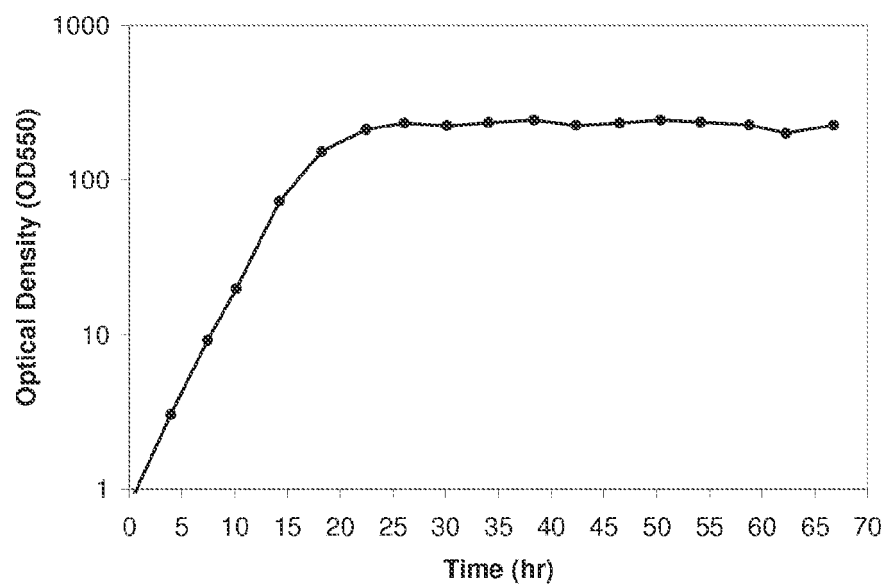


Figure 117



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Figure 118

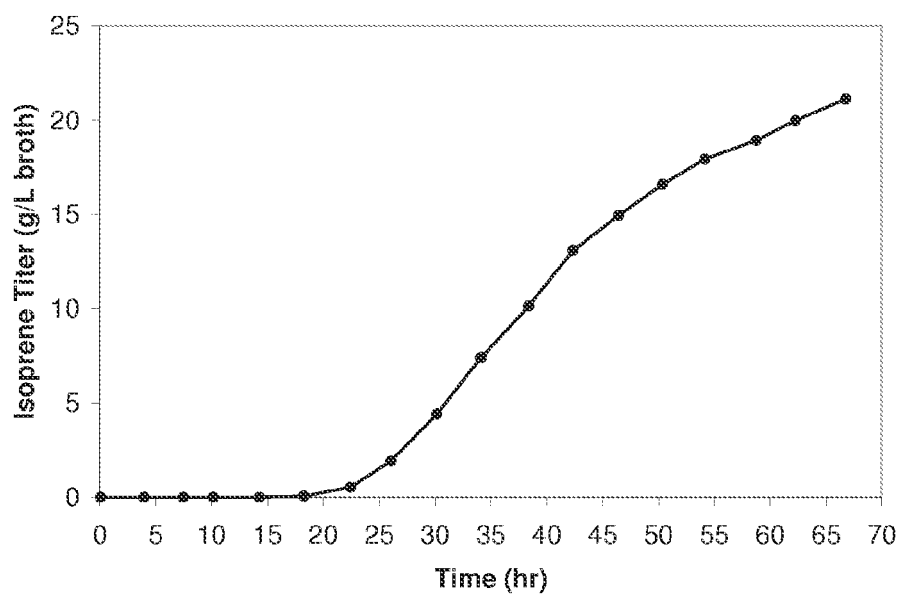


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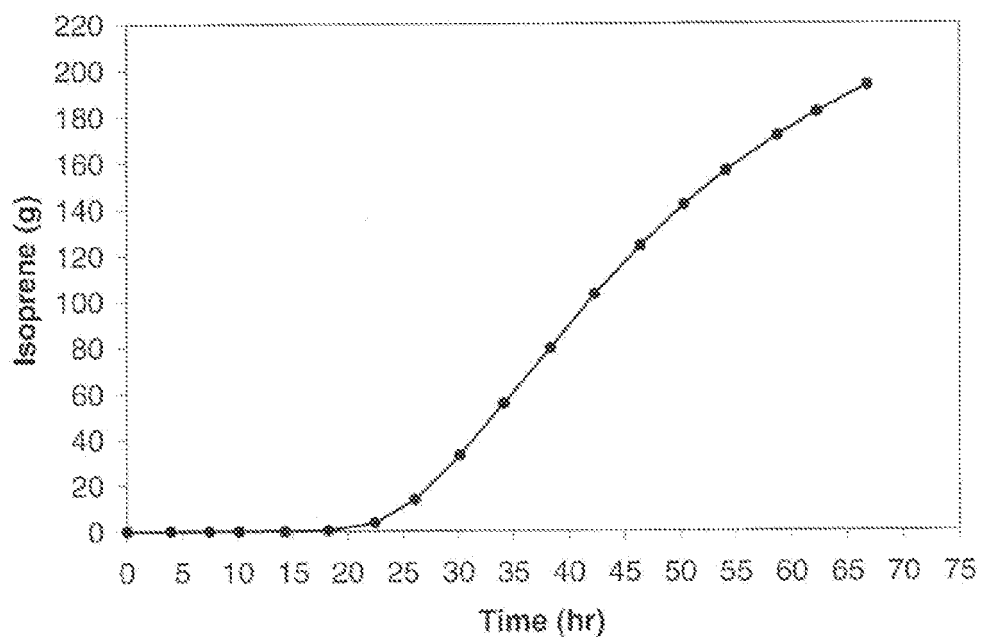


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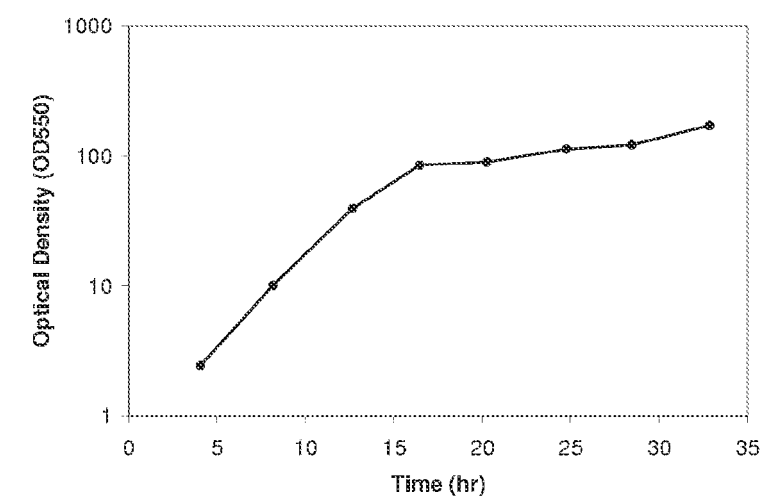
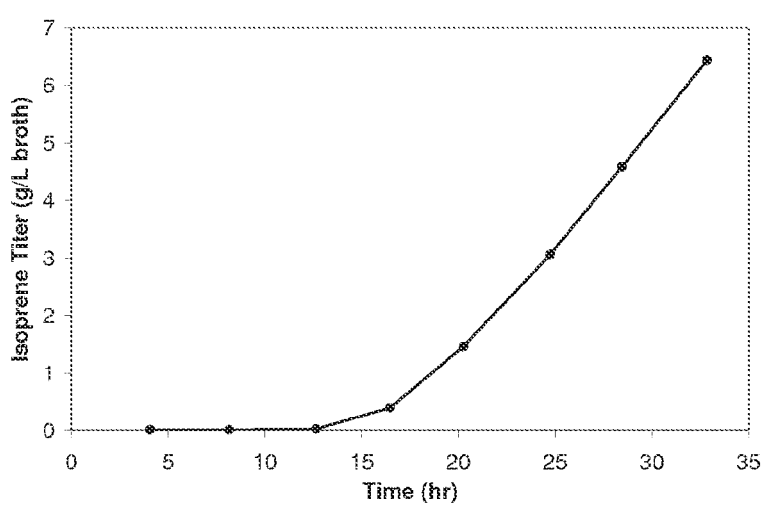


Figure 121



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Figure 122

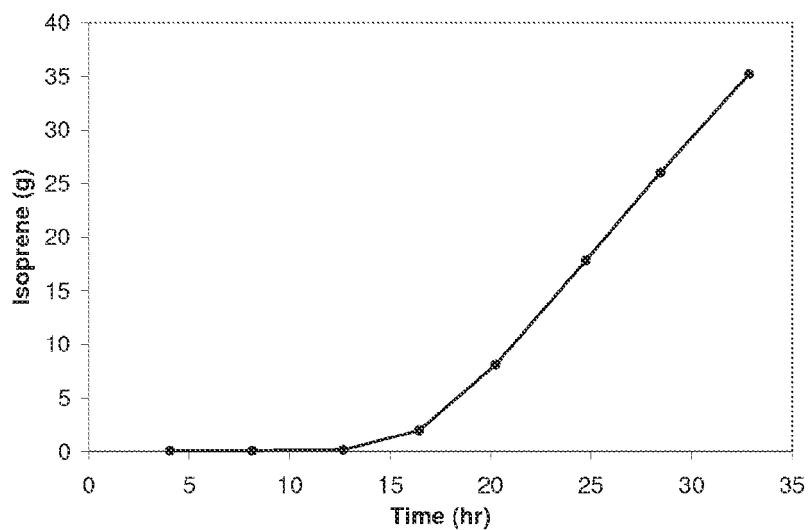


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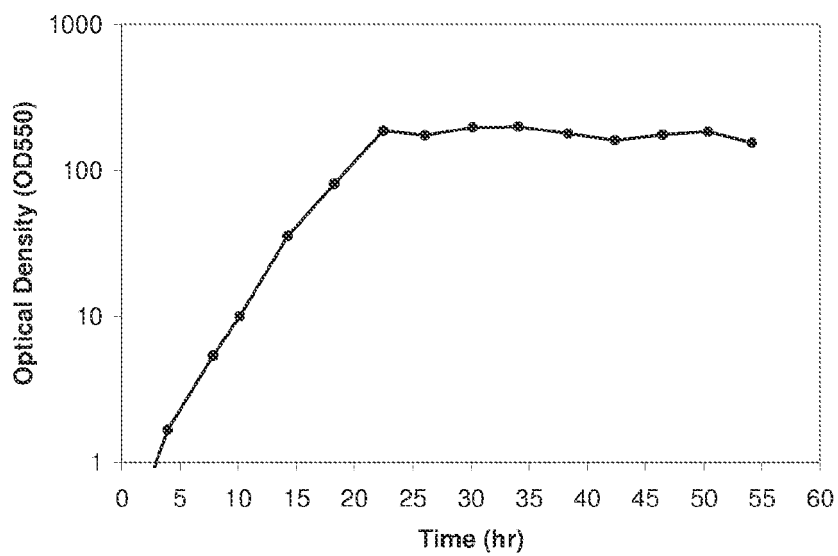


Figure 124

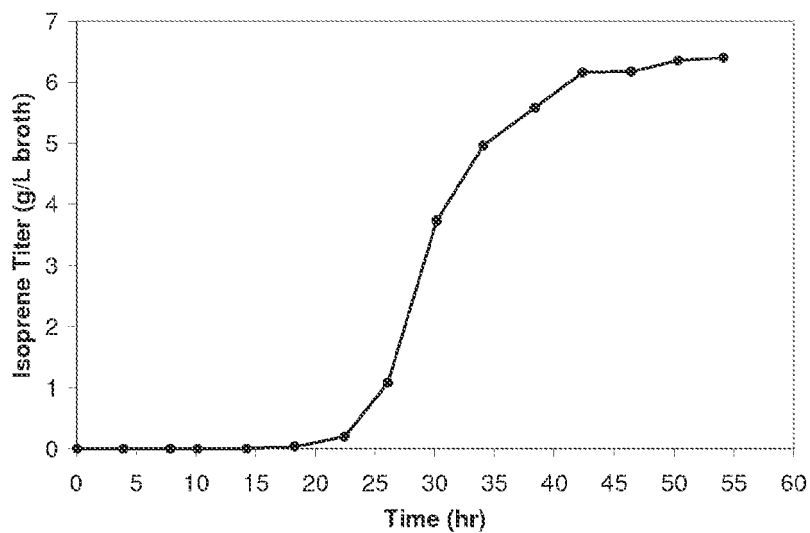


Figure 125

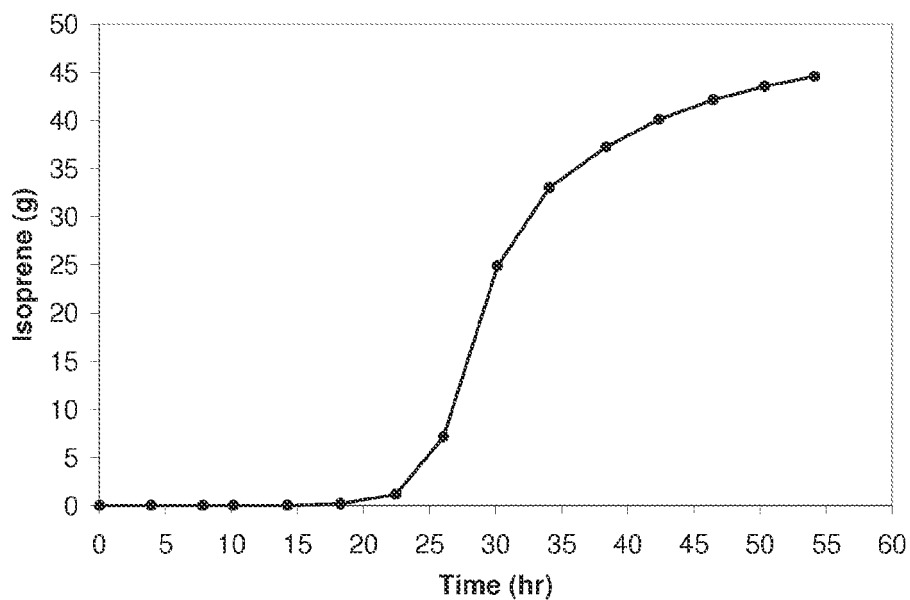


Figure 126A

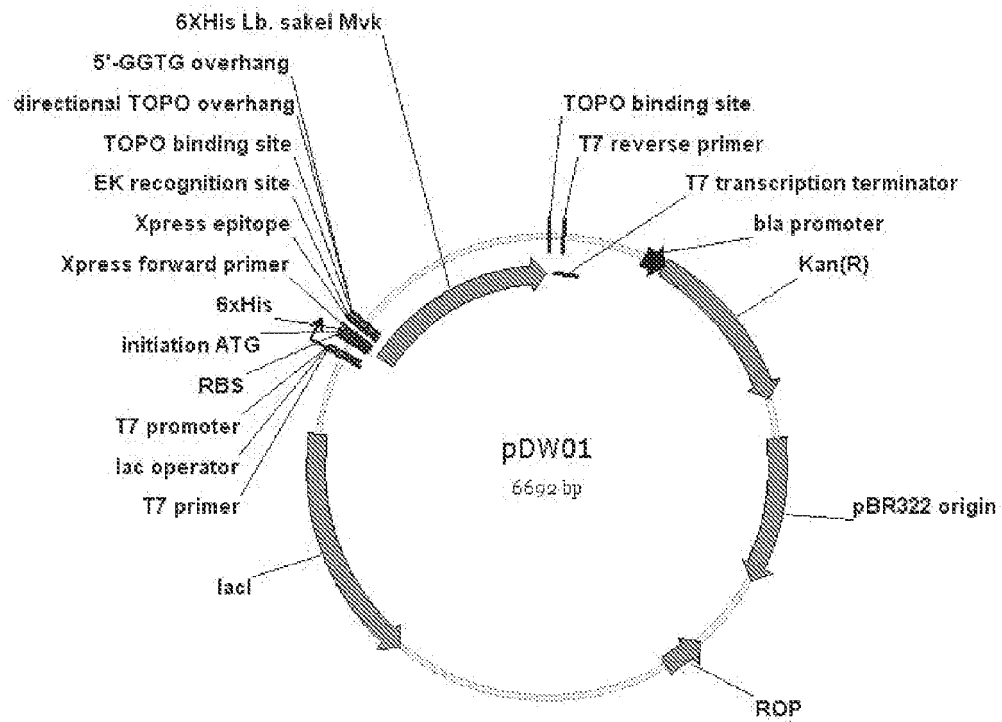
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Figure 126B

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Figure 127A



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Figure 127C

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(SEQ ID NO:112)

Figure 128A

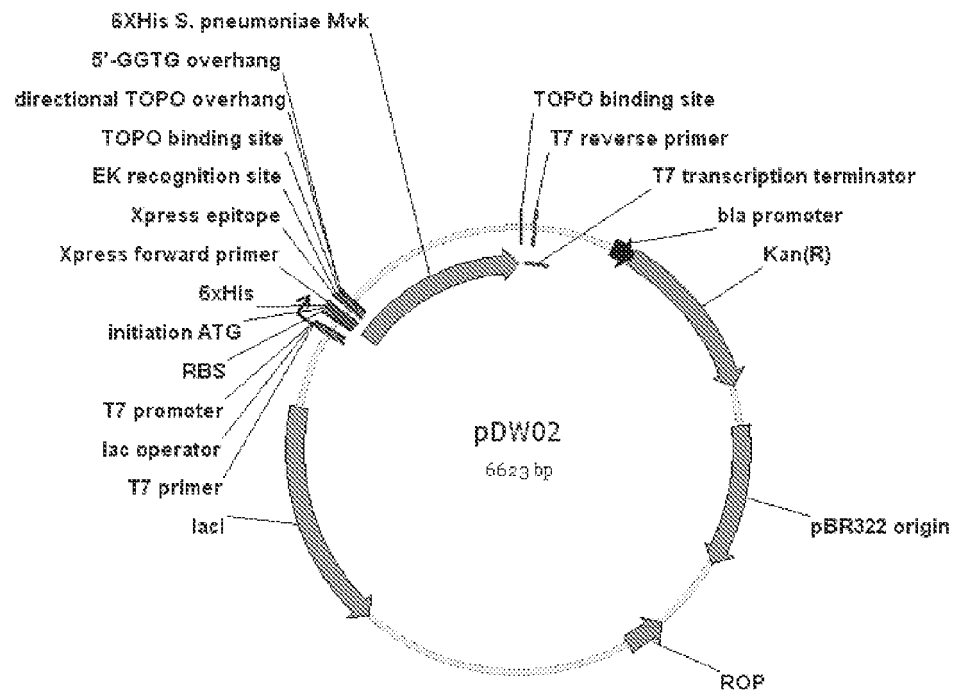
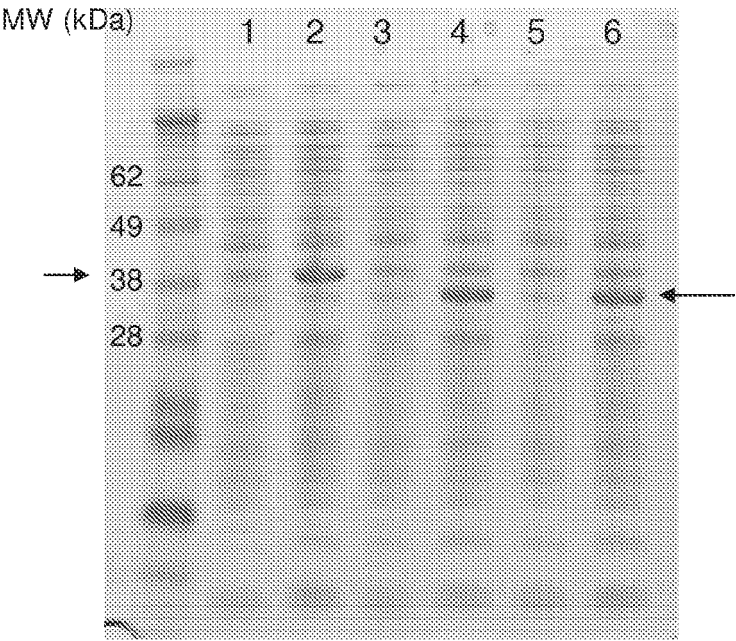


Figure 128C

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(SEQ ID NO:113)

Figure 129



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Figure 130

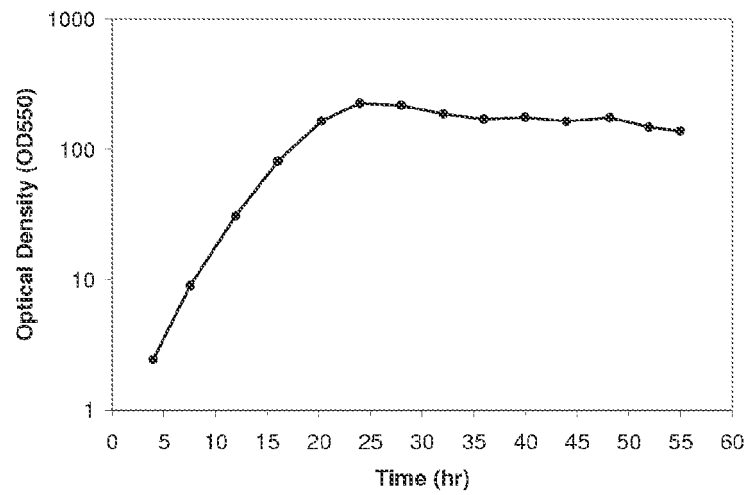
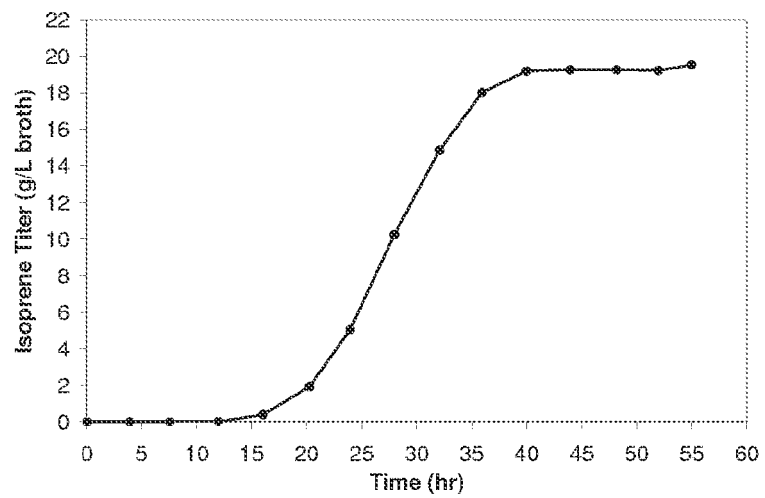


Figure 131



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Figure 132

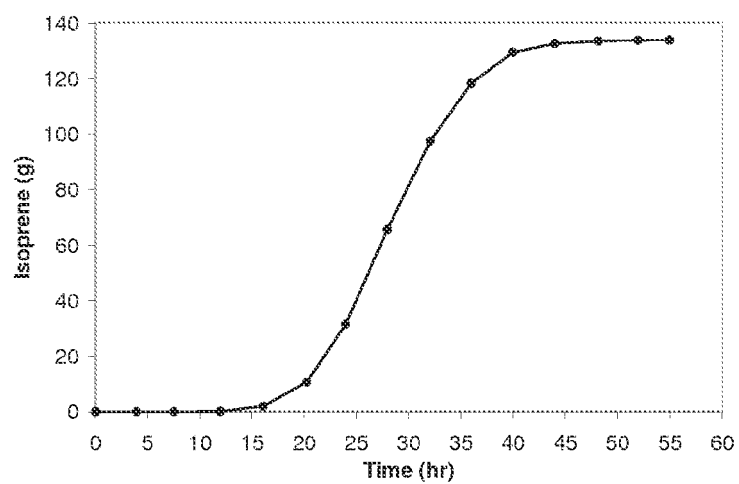
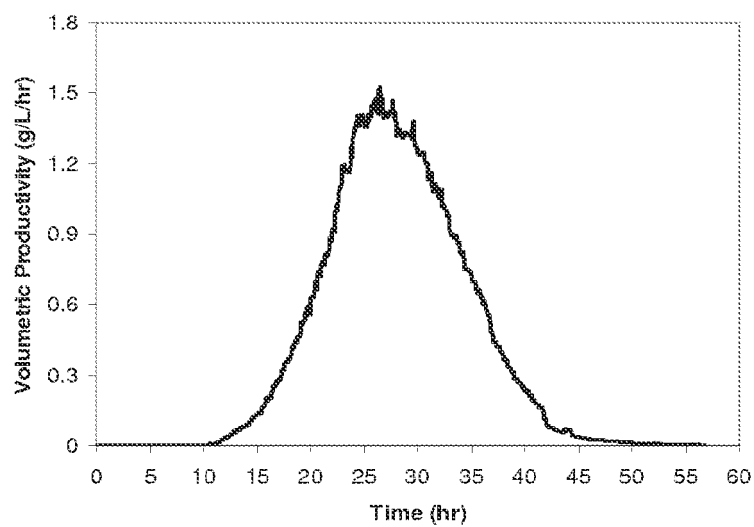


Figure 133



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Figure 134

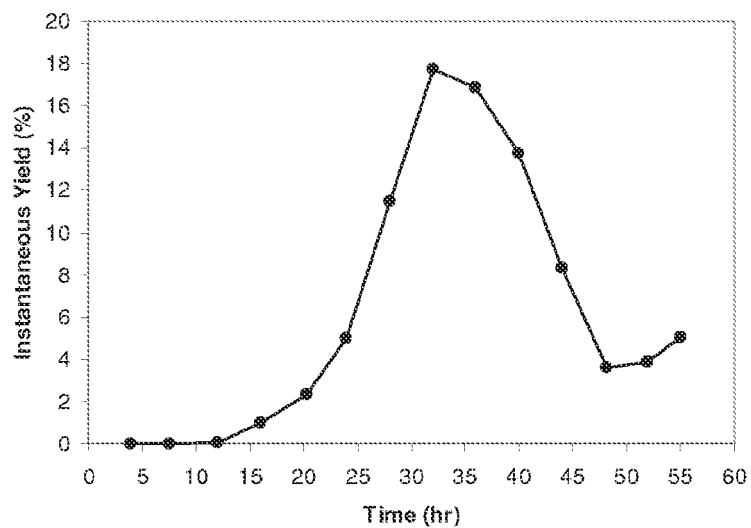
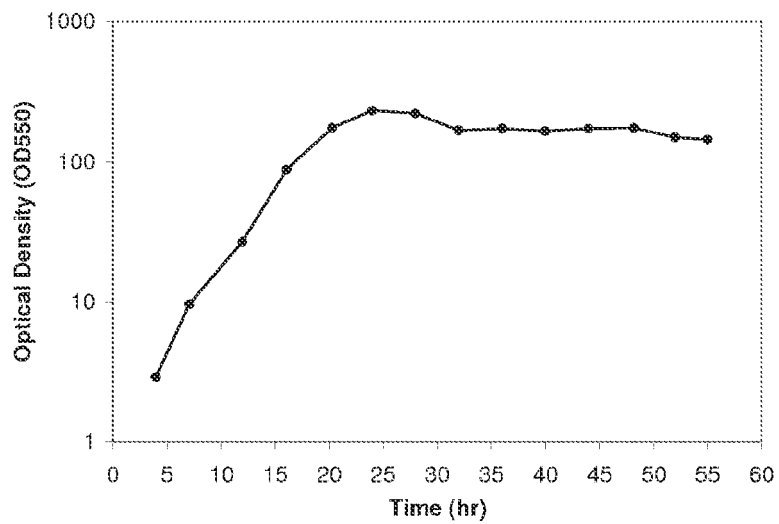


Figure 135



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Figure 136

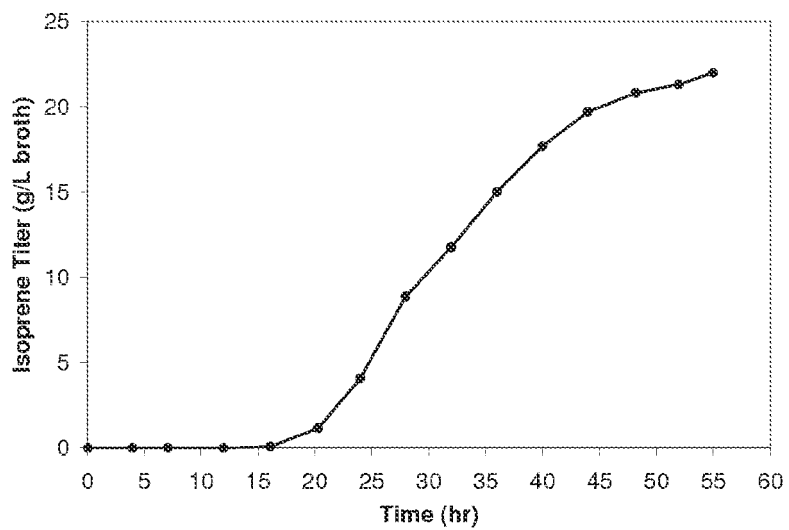


Figure 137

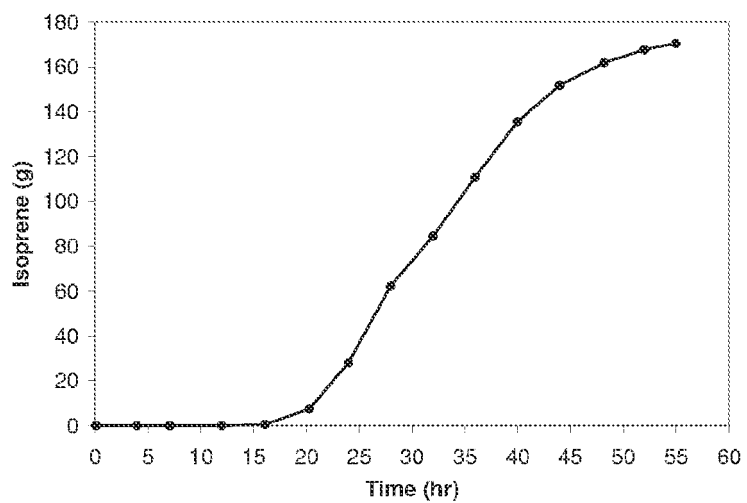


Figure 138A

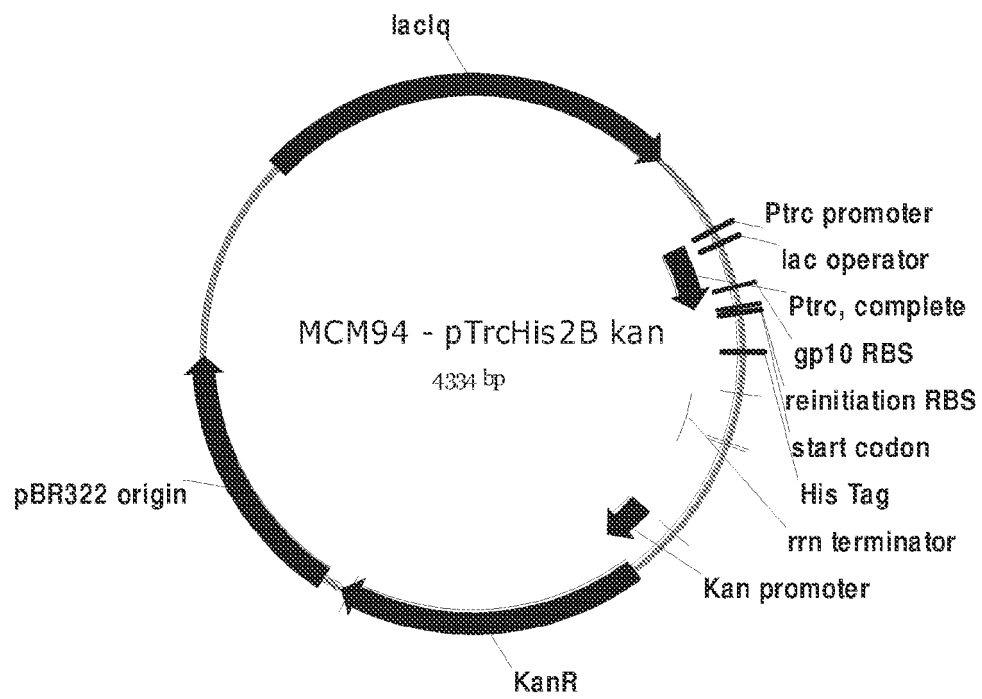
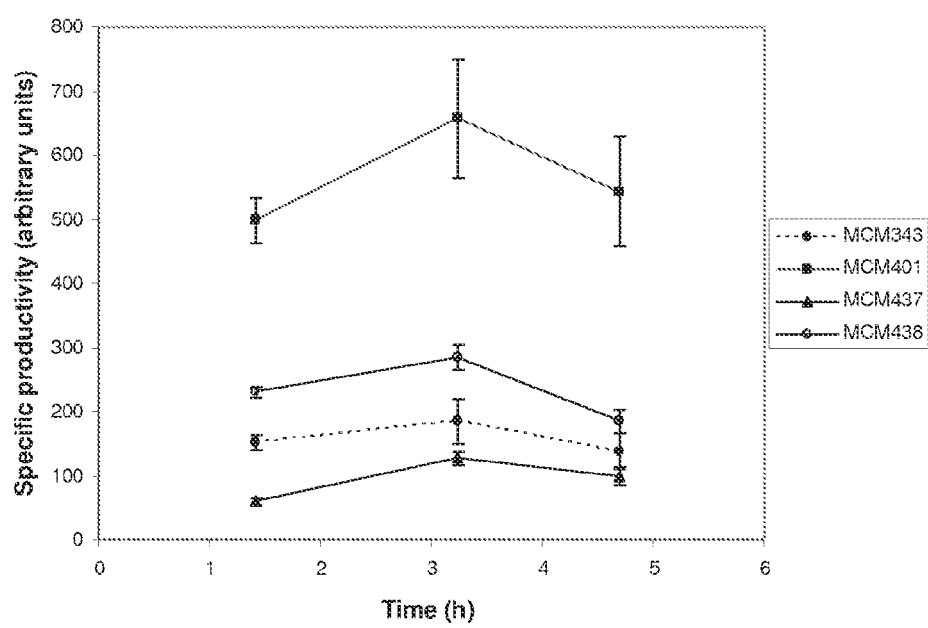


Figure 138C

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(SEQ ID NO:114)

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Figure 139



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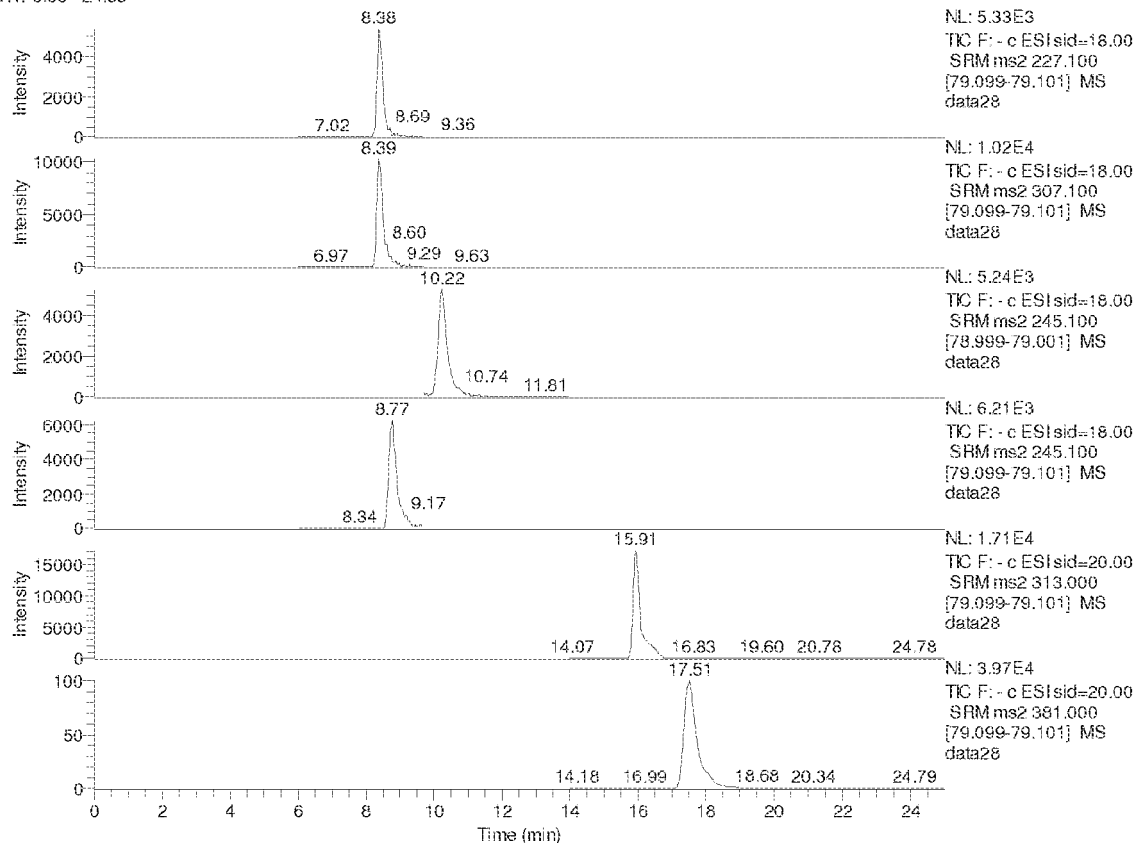
Figure 140

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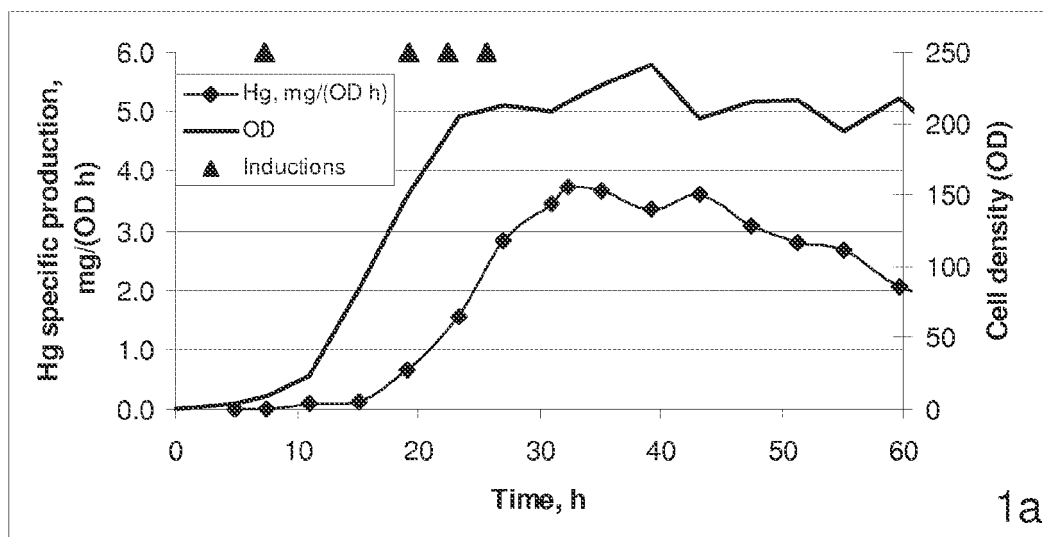
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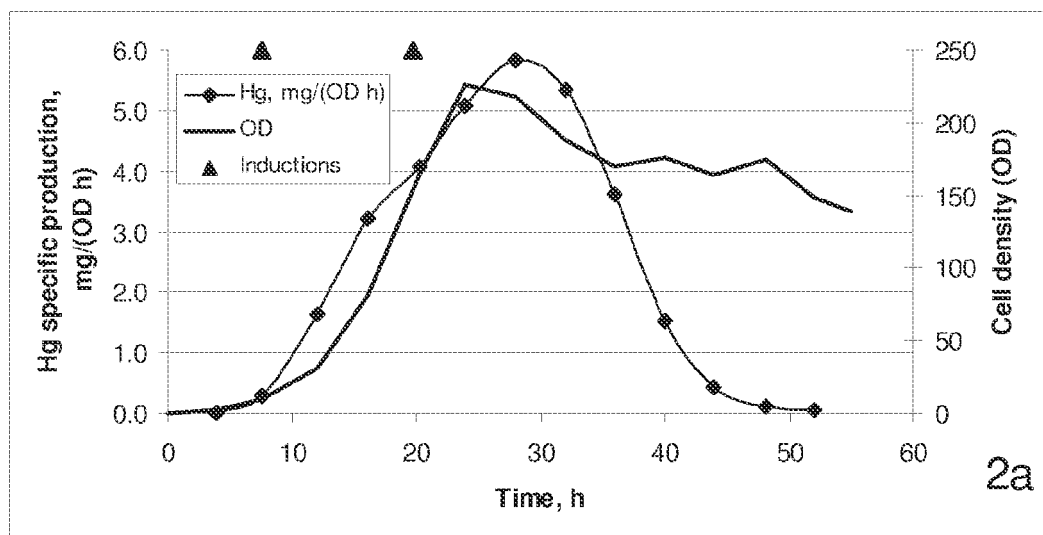


Figures 141A-141B

A

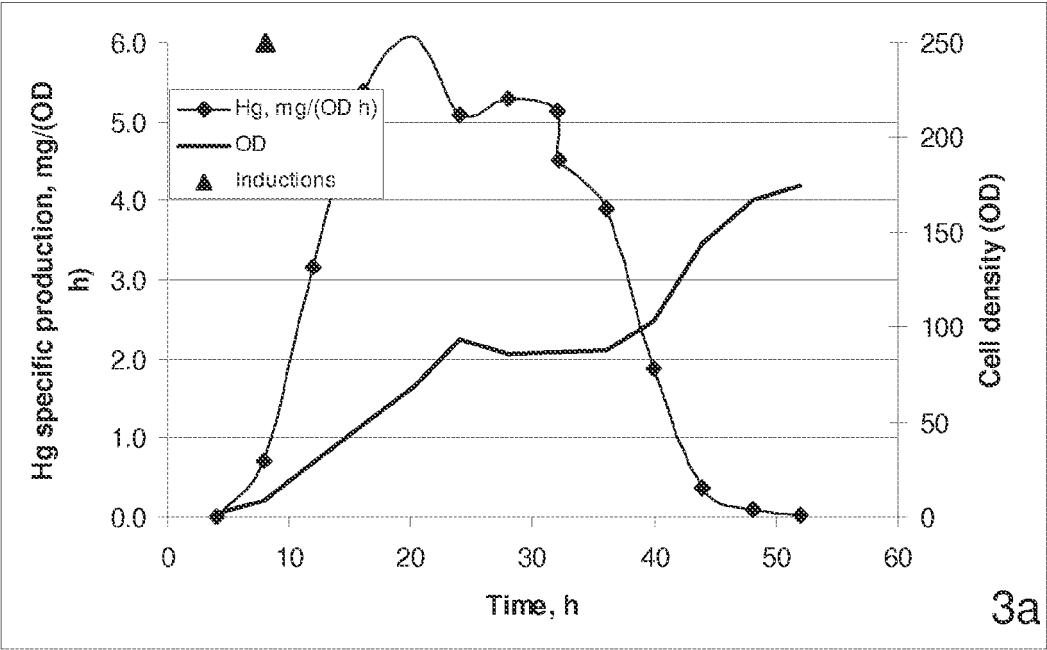


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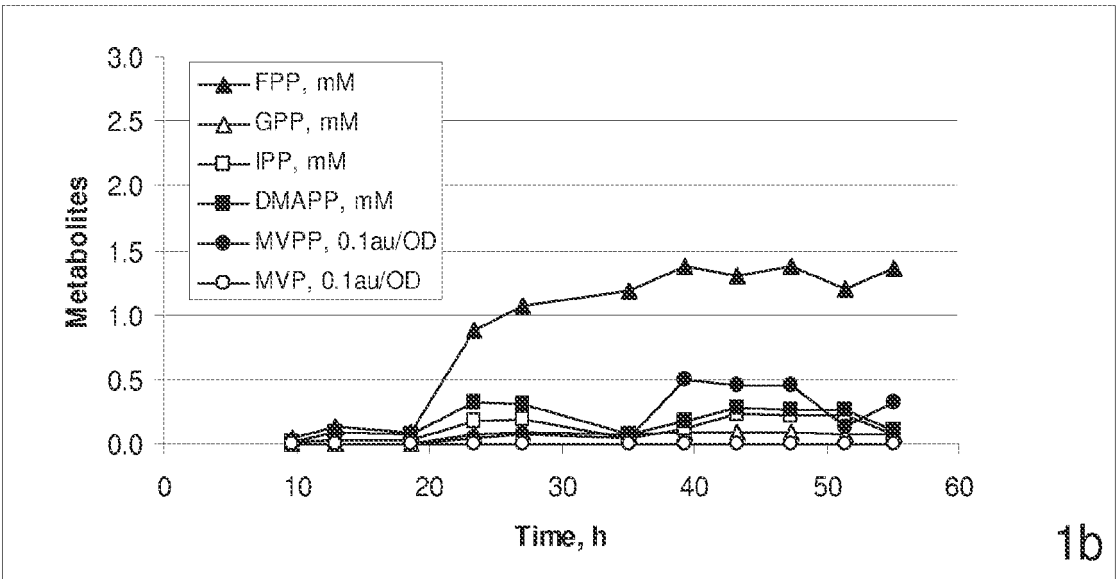


Figures 141C-141D

C



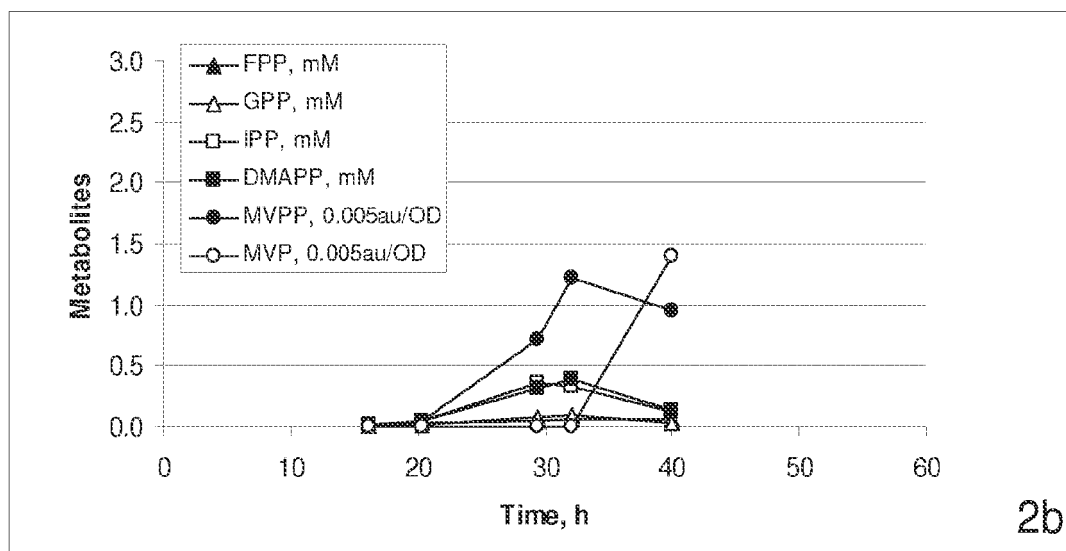
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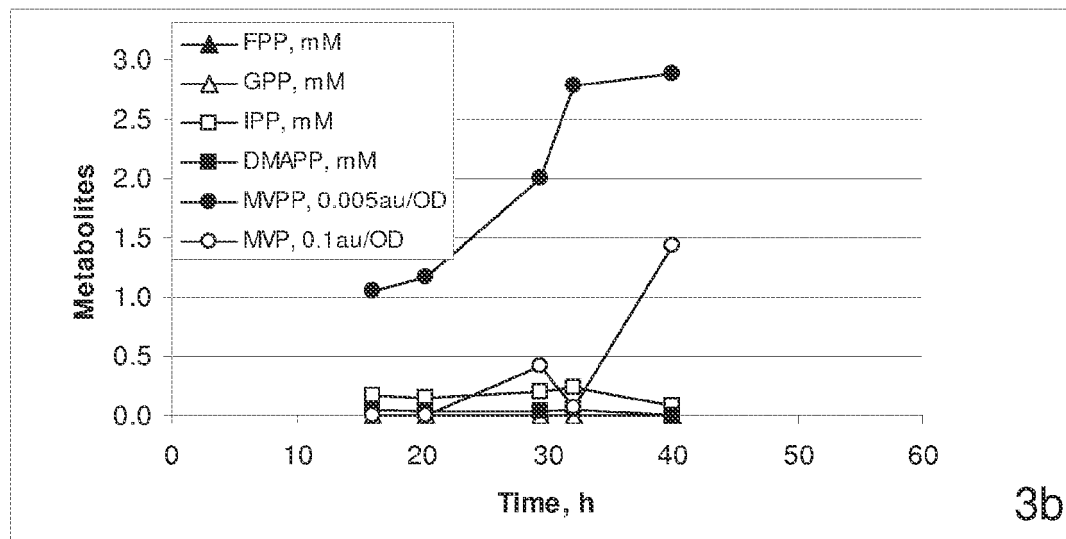
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Figures 141E-141F

E

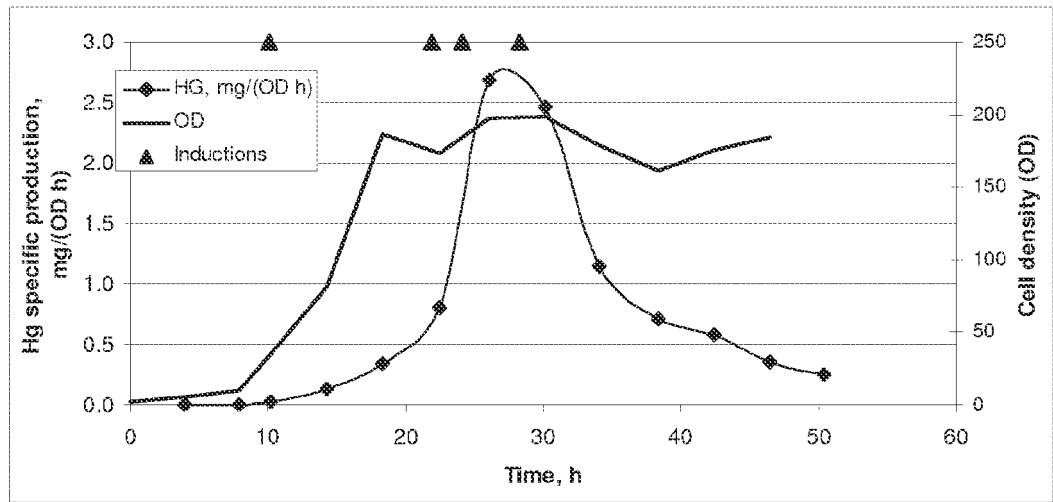


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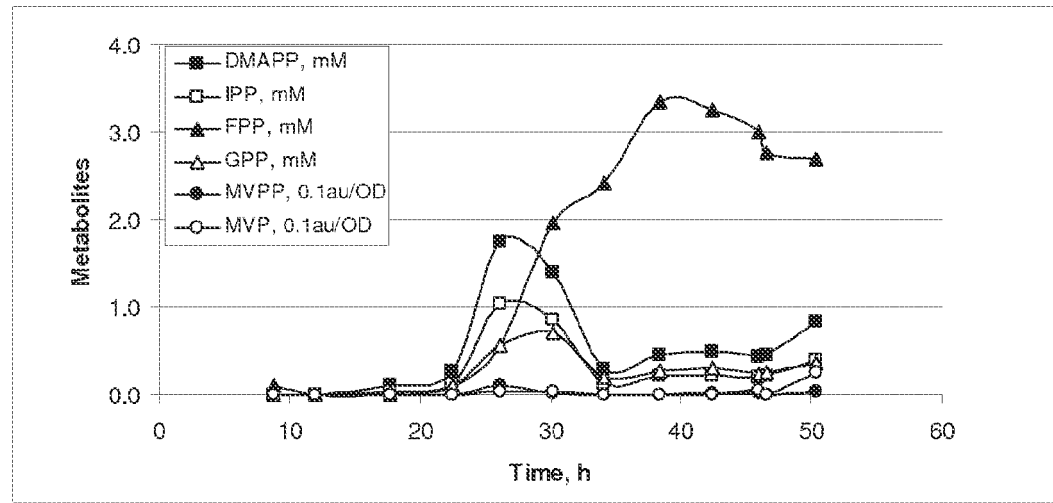


Figures 142A-142B

A

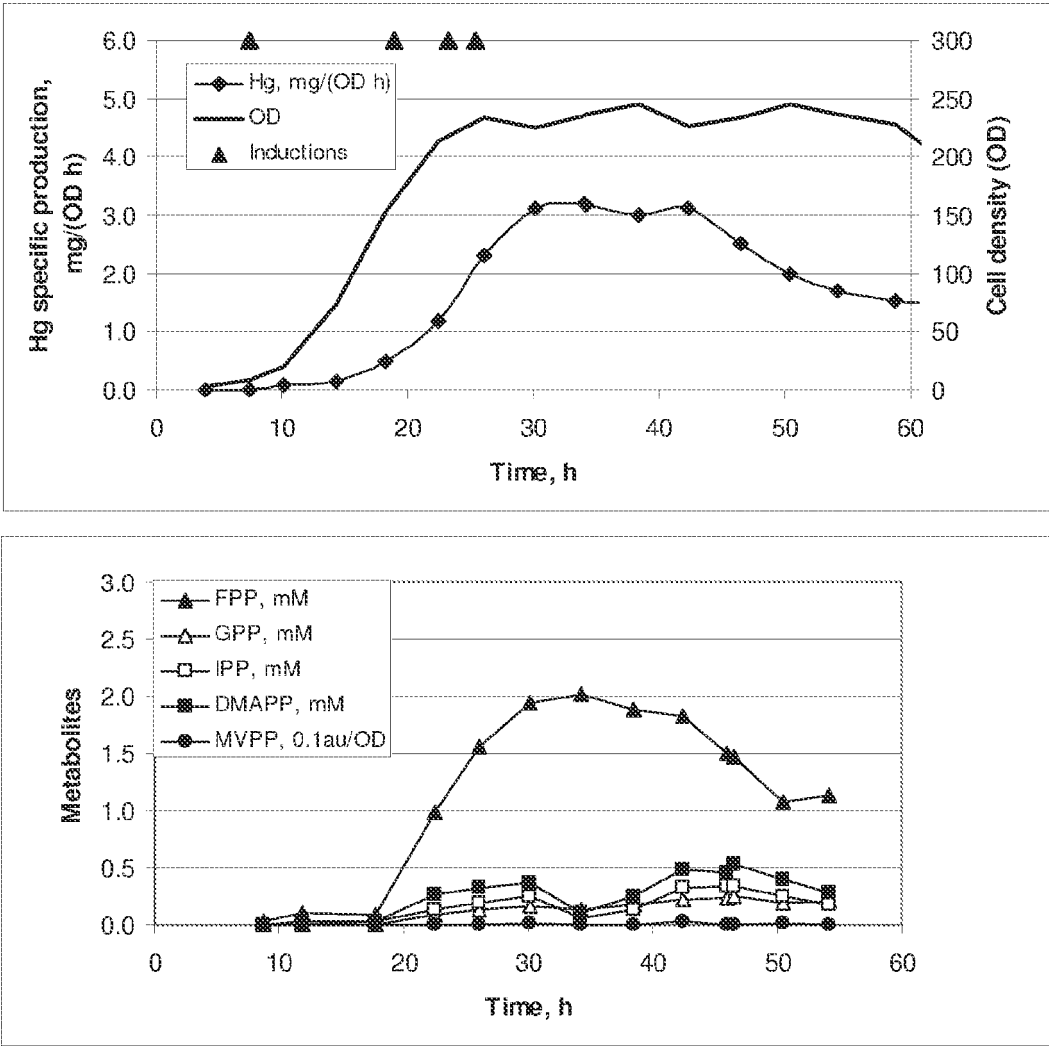


B



Figures 143A-143B

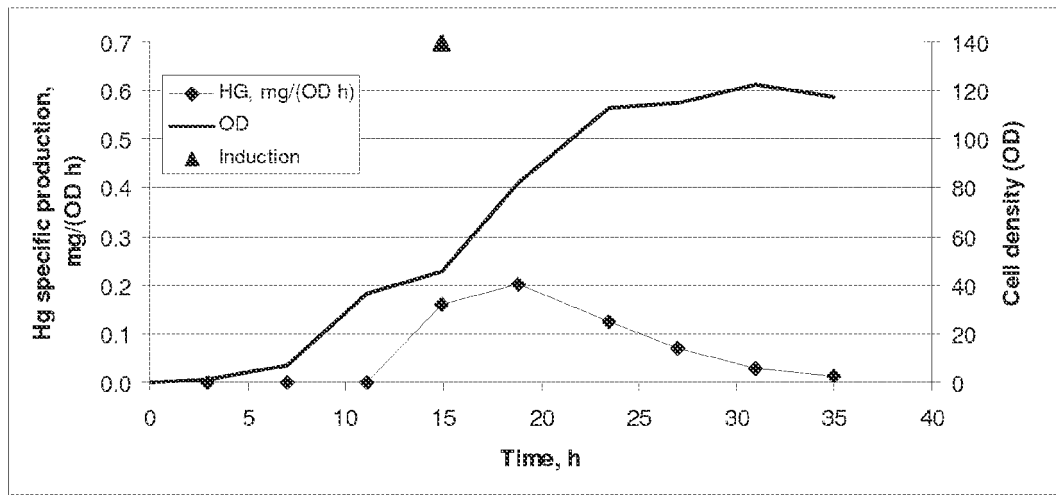
A



B

Figures 144A-144B

A



B

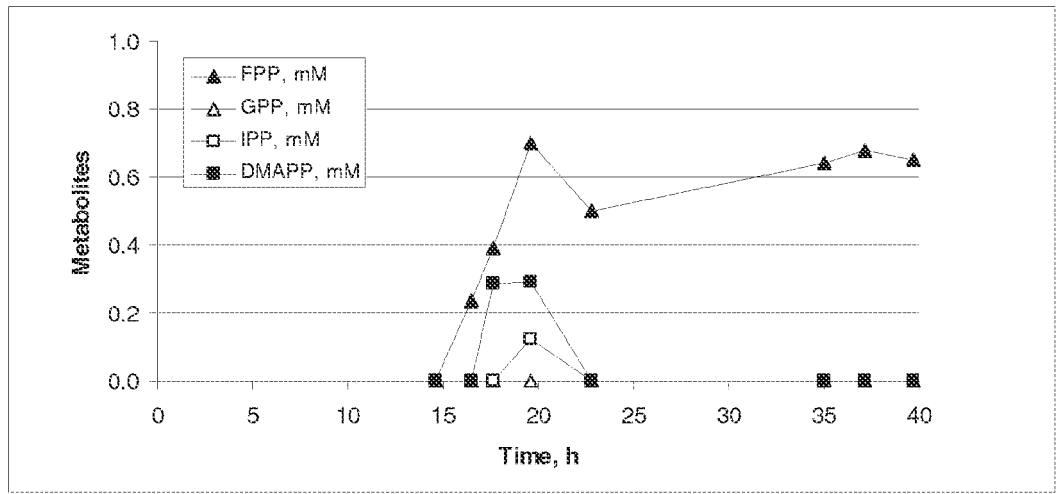
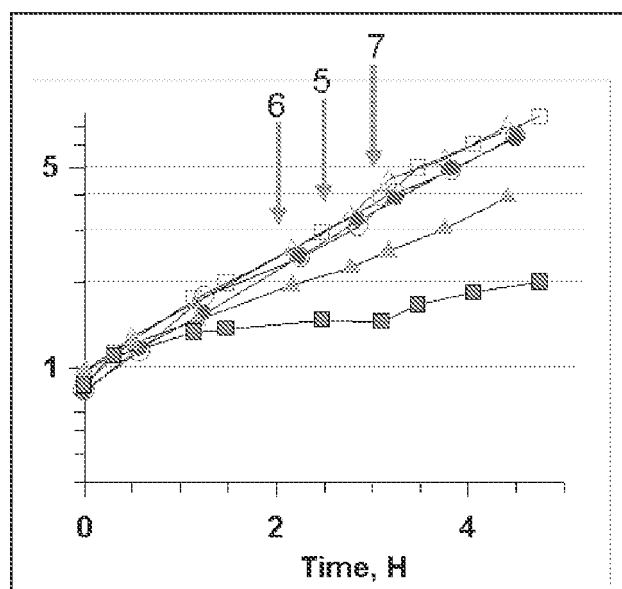


Figure 145



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Figure 146

