

SEQUENCE LISTING

<110> BONUMOSE LLC

<120> ENZYMATIC PRODUCTION OF D-ALLULOSE

<130> 146.0003-W000

<150> 62/434,033

<151> 2016-12-14

<160> 9

<170> PatentIn version 3.5

<210> 1

<211> 663

<212> DNA

<213> Thermoanaerobacterium thermosaccharolyticum

<400> 1

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atatctgttc ttaatagcaa ggcggatttt ttgcatgttg acatcatgga tggccatttt 120

gttaaaaata ttactttatc accgtttttt atagagcaga ttaaatacata tgtcaatatt 180

cctattgatg cacaccttat ggtagaaaat ccaggtgatt atattgaaat atgcgaaaaa 240

tcgggagcaa gttttataac tatacatgca gaaacaatta atagagaagc atttagaata 300

atagatagaa ttaaaagtca tggactcatg gttggcatag cattgaatcc agcaacacct 360

atttcggaaa ttaaacatta tattaataaa atagataaga taacaataat gactgtcgat 420

cccggcttcg ctgggtcaacc atttattccg gaggtattgg aaaagatccg agatctaaag 480

agactgaaag atgataataa ttataattat ttaattgaag cagatggttc ctgcaataaa 540

aatacgtttc aagtgctaaa agatgccgga tgtaaagttt tcgtattagg ttcacaggg 600

ctttttaatc ttagcgatga tttgggaaaa gcgtgggaaa taatgattgg caattttaat 660

gga 663

<210> 2

<211> 663

<212> DNA

<213> Artificial Sequence

<220>

<223> artifical sequence

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gttaagaaca tcaccctgag cccgtttttc attgaacaga ttaagagcta tgtgaatata 180
ccgattgatg cccatctgat ggtggaaaat ccgggtgact atattgaaat ttgtgaaaaa 240
agcggcgcaa gttttattac cattcatgcc gaaaccatta atcgtgaagc atttcgtatt 300
attgaccgta ttaagagtca tggctctgatg gtgggcattg cactgaatcc ggccaccccg 360
attagcgaat ttaagcatta tattaacaag atcgacaaga tcaccattat gaccgttgat 420
ccgggctttg caggccagcc gtttattccg gaagtgtctg aaaaaattcg cgatctgaaa 480
cgtctgaaag atgataataa ttacaactac ctgatcgaag ccgatggtag ttgcaataag 540
aatacctttc aggttctgaa agatgcaggc tgcaaagttt ttgtgctggg cagtagcggt 600
ctgtttaatc tgagtgatga tctgggcaaa gcatgggaaa ttatgattgg caattttaat 660
ggc 663

<210> 3
<211> 221
<212> PRT
<213> Thermoanaerobacterium thermosaccharolyticum

<400> 3

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Leu Asn Glu Gln Ile Ser Val Leu Asn Ser Lys Ala Asp Phe Leu His
20 25 30

Val Asp Ile Met Asp Gly His Phe Val Lys Asn Ile Thr Leu Ser Pro
35 40 45

Phe Phe Ile Glu Gln Ile Lys Ser Tyr Val Asn Ile Pro Ile Asp Ala
50 55 60

His Leu Met Val Glu Asn Pro Gly Asp Tyr Ile Glu Ile Cys Glu Lys
65 70 75 80

Ser Gly Ala Ser Phe Ile Thr Ile His Ala Glu Thr Ile Asn Arg Glu

85

90

95

Ala Phe Arg Ile Ile Asp Arg Ile Lys Ser His Gly Leu Met Val Gly
 100 105 110

Ile Ala Leu Asn Pro Ala Thr Pro Ile Ser Glu Ile Lys His Tyr Ile
 115 120 125

Asn Lys Ile Asp Lys Ile Thr Ile Met Thr Val Asp Pro Gly Phe Ala
 130 135 140

Gly Gln Pro Phe Ile Pro Glu Val Leu Glu Lys Ile Arg Asp Leu Lys
 145 150 155 160

Arg Leu Lys Asp Asp Asn Asn Tyr Asn Tyr Leu Ile Glu Ala Asp Gly
 165 170 175

Ser Cys Asn Lys Asn Thr Phe Gln Val Leu Lys Asp Ala Gly Cys Lys
 180 185 190

Val Phe Val Leu Gly Ser Ser Gly Leu Phe Asn Leu Ser Asp Asp Leu
 195 200 205

Gly Lys Ala Trp Glu Ile Met Ile Gly Asn Phe Asn Gly
 210 215 220

<210> 4
 <211> 690
 <212> DNA
 <213> Bacillus thermoamylovorans

<400> 4
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 gaacagatta cttttttaaa taatcatgtc ggttcttacc atatcgatat tatggacgga 120
 cattatgtac ctaatataac tctatcccct tggtttgtcc aagaggtacg gaaaattagt 180
 gatgttccga tgtctgccca cttgatggtc acaaaccxaa gtttttgggt acaacaactc 240
 attgatatta agtgtgaatg gatttgcacg cacgtagaaa cccttgatgg gttagctttc 300
 cgcttaattg atcaaacca cgatgcggga ttaaaagcag gggtcgtatt aaatcctgaa 360
 acaagtgttg atgcgattcg cccgtacatt gatttagtgg ataaagtcac cattatgact 420

gtcgaccag gttttgcagg tcaacgcttt attgatagta cattggagaa aatcgtggaa	480
ttaagaaaat tacgggaaga acacggttat aaatatgtga ttgaaatgga tggatcttcg	540
aatcggaaat cttcaagaa aatttatgaa gccggtcctg acatttatat tataggctgc	600
agcggtttgt ttggattaca cgaagatatc gaaaaagcat gggaaatcat gtgcaaagat	660
tttgaggaaa tgactggcga aaaagtatta	690

<210> 5
 <211> 690
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Thermophilic A6PE from Bacillus thermoamylovorans Codon optimized

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gaacagatca cttttctgaa caatcatgtt ggcagttatc atattgatat catggatggt	120
cattacgtgc cgaatattac cctgagcccg tggtttggtc aggaagtgcg caaaattagc	180
gatgttccga tgagcgcaca tctgatgggt accaatccga gtttttgggt tcagcagctg	240
attgatatta aatgtgaatg gatttgcatt catgttgaaa ccctggatgg cctggccttt	300
cgtctgattg atcagattca tgatgccggc ctgaaagcag gtgtggttct gaatccggaa	360
accagtgtgg atgccattcg tccgtatatt gatctgggtg ataaagtac catcatgacc	420
gtggatccgg gctttgccgg ccagcgcttt attgatagca ccctggaaaa aattgtggaa	480
ctgcgtaaac tgcgtgaaga acatggttat aaatatgtga ttgagatgga tggcagcagc	540
aatcgcaaaa gctttaaaaa aatttacgag gcaggtccgg atatttatat tattggccgt	600
agtggcctgt ttggcctgca tgaagatatt gaaaaagcat gggaaattat gtgtaaggat	660
tttgaagaaa tgaccggtga aaaagtgtctg	690

<210> 6
 <211> 230
 <212> PRT
 <213> Bacillus thermoamylovorans

<400> 6

Met Ser Asn Lys Ile Glu Phe Ser Pro Ser Leu Met Thr Met Asp Leu

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	20	25	30
Tyr His Ile	Asp Ile Met Asp Gly His Tyr Val Pro Asn Ile Thr Leu		
	35	40	45
Ser Pro Trp	Phe Val Gln Glu Val Arg Lys Ile Ser Asp Val Pro Met		
	50	55	60
Ser Ala His	Leu Met Val Thr Asn Pro Ser Phe Trp Val Gln Gln Leu		
65	70	75	80
Ile Asp Ile	Lys Cys Glu Trp Ile Cys Met His Val Glu Thr Leu Asp		
	85	90	95
Gly Leu Ala	Phe Arg Leu Ile Asp Gln Ile His Asp Ala Gly Leu Lys		
	100	105	110
Ala Gly Val	Val Leu Asn Pro Glu Thr Ser Val Asp Ala Ile Arg Pro		
	115	120	125
Tyr Ile Asp	Leu Val Asp Lys Val Thr Ile Met Thr Val Asp Pro Gly		
	130	135	140
Phe Ala Gly	Gln Arg Phe Ile Asp Ser Thr Leu Glu Lys Ile Val Glu		
145	150	155	160
Leu Arg Lys	Leu Arg Glu Glu His Gly Tyr Lys Tyr Val Ile Glu Met		
	165	170	175
Asp Gly Ser	Ser Asn Arg Lys Ser Phe Lys Lys Ile Tyr Glu Ala Gly		
	180	185	190
Pro Asp Ile	Tyr Ile Ile Gly Arg Ser Gly Leu Phe Gly Leu His Glu		
	195	200	205
Asp Ile Glu	Lys Ala Trp Glu Ile Met Cys Lys Asp Phe Glu Glu Met		
	210	215	220

Thr Gly Glu Lys Val Leu
225 230

<210> 7
<211> 651
<212> DNA
<213> Clostridium thermocellum

<400> 7
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gctgttatag aatgtattaa ctatgcactg caaaaaatgg gttatcccga atcttctccg 120
gaaagtatth gcagaacaat aggacttacg ttggccgagg cttttaaaat acttagcggg 180
gatacttctg attccaatgc ggaccttttc cgccaatact ttaaagaaag agcagatctg 240
gttatgtgtg accggactgt aatgtacagc actgttgaat gtgttttgaa gaagctgaaa 300
aaggcggatg taaaaacagg aattgtttca acgaagtaca gatacaggat agaggatata 360
ttaaaaaggg acaaactttt acagtatttt gatgtaattg tcggcgggga agatgttgcg 420
gcccataaac cggatccgga agggcttcta aaggccatat cgatggttgg ctgccaaaag 480
gaagaagtcc tttttgtcgg agacagtacg gtggatgcaa ggactgcaaa aaatgcggga 540
gtggattttg tggcggttct tacggggaca accggggcaa atgagttttc agagtataat 600
cctggtgctg tgattgaaga tttagtggt ttattggata tgtttatggt a 651

<210> 8
<211> 651
<212> DNA
<213> Artificial Sequence

<220>
<223> Codon optimized A6PP from Clostridium thermocellum

<400> 8
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gccgttattg aatgtattaa ttacgccctg cagaaaatgg gctatccgga aagcagtcg 120
gaaagcattt gtcgtaccat tggcctgacc ctggcagaag catttaaaat tctgagcgg 180
gataccagcg atagcaatgc cgatctgttt cgccagtatt ttaaagaacg cgcagatctg 240
gttatgtgtg atcgcaccgt gatgtatagc accgtggaat gcgtgctgaa aaaactgaaa 300
aaagcagatg ttaagaccgg tattgtgagc accaaatatc gctatcgtat tgaagatatt 360

ctgaaacgtg ataaactgct gcagtatctt gatgttattg ttggtggcga agatgttgcc 420
 gcccataaac cggatccgga aggcctgctg aaagcaatta gcatggtggg ctgccagaaa 480
 gaagaagttc tgtttggttg tgatagcacc gttgatgcac gtaccgcaa aaatgcaggc 540
 gtggattttg tggccgttct gaccggcacc accggcgcaa atgaatttag cgaatataat 600
 ccgggcgccc tgattgaaga tctgagcggc ctgctggata tgtttatgct g 651

<210> 9
 <211> 217
 <212> PRT
 <213> Clostridium thermocellum

<400> 9

Met Ile Lys Tyr Lys Ala Val Phe Phe Asp Phe Asp Tyr Thr Leu Ala
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Asp Ser Ser Lys Ala Val Ile Glu Cys Ile Asn Tyr Ala Leu Gln Lys
 20 25 30

Met Gly Tyr Pro Glu Ser Ser Pro Glu Ser Ile Cys Arg Thr Ile Gly
 35 40 45

Leu Thr Leu Ala Glu Ala Phe Lys Ile Leu Ser Gly Asp Thr Ser Asp
 50 55 60

Ser Asn Ala Asp Leu Phe Arg Gln Tyr Phe Lys Glu Arg Ala Asp Leu
 65 70 75 80

Val Met Cys Asp Arg Thr Val Met Tyr Ser Thr Val Glu Cys Val Leu
 85 90 95

Lys Lys Leu Lys Lys Ala Asp Val Lys Thr Gly Ile Val Ser Thr Lys
 100 105 110

Tyr Arg Tyr Arg Ile Glu Asp Ile Leu Lys Arg Asp Lys Leu Leu Gln
 115 120 125

Tyr Phe Asp Val Ile Val Gly Gly Glu Asp Val Ala Ala His Lys Pro
 130 135 140

Asp Pro Glu Gly Leu Leu Lys Ala Ile Ser Met Val Gly Cys Gln Lys
145 150 155 160

Glu Glu Val Leu Phe Val Gly Asp Ser Thr Val Asp Ala Arg Thr Ala
165 170 175

Lys Asn Ala Gly Val Asp Phe Val Ala Val Leu Thr Gly Thr Thr Gly
180 185 190

Ala Asn Glu Phe Ser Glu Tyr Asn Pro Gly Ala Val Ile Glu Asp Leu
195 200 205

Ser Gly Leu Leu Asp Met Phe Met Leu
210 215