

SequenceListing-W01216
SEQUENCE LISTING

<110> Kabushiki Kaisha Hayashibara Seibutsu Kagaku Kenkyujo

<120> Particulate composition containing anhydrous crystalline 2-O-alpha-D-glucosyl-L-ascorbic acid, process for producing

the same, and uses thereof

<130> W01216

<160> 2

<210> 1

<211> 680

<212> PRT

<213> Geobacillus stearothermophilus

<400> 1

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Ala Gly Asn Leu Asn Lys Val Asn Phe Thr Ser Asp Val Val Tyr Gln
      5      10      15
Ile Val Val Asp Arg Phe Val Asp Gly Asn Thr Ser Asn Asn Pro Ser
      20      25      30
Gly Ala Leu Phe Ser Ser Gly Cys Thr Asn Leu Arg Lys Tyr Cys Gly
      35      40      45
Gly Asp Trp Gln Gly Ile Ile Asn Lys Ile Asn Asp Gly Tyr Leu Thr
      50      55      60
Asp Met Gly Val Thr Ala Ile Trp Ile Ser Gln Pro Val Glu Asn Val
      65      70      75      80
Phe Ser Val Met Asn Asp Ala Ser Gly Ser Ala Ser Tyr His Gly Tyr
      85      90      95
Trp Ala Arg Asp Phe Lys Lys Pro Asn Pro Phe Phe Gly Thr Leu Ser
      100      105      110
Asp Phe Gln Arg Leu Val Asp Ala Ala His Ala Lys Gly Ile Lys Val
      115      120      125
Ile Ile Asp Phe Ala Pro Asn His Thr Ser Pro Ala Ser Glu Thr Asn
      130      135      140
Pro Ser Tyr Met Glu Asn Gly Arg Leu Tyr Asp Asn Gly Thr Leu Leu
      145      150      155      160
Gly Gly Tyr Thr Asn Asp Ala Asn Met Tyr Phe His His Asn Gly Gly
      165      170      175
Thr Thr Phe Ser Ser Leu Glu Asp Gly Ile Tyr Arg Asn Leu Phe Asp
      180      185      190
Leu Ala Asp Leu Asn His Gln Asn Pro Val Ile Asp Arg Tyr Leu Lys
      195      200      205
Asp Ala Val Lys Met Trp Ile Asp Met Gly Ile Asp Gly Ile Arg Met
      210      215      220
Asp Ala Val Lys His Met Pro Phe Gly Trp Gln Lys Ser Leu Met Asp
      225      230      235      240
Glu Ile Asp Asn Tyr Arg Pro Val Phe Thr Phe Gly Glu Trp Phe Leu
      245      250      255
Ser Glu Asn Glu Val Asp Ala Asn Asn His Tyr Phe Ala Asn Glu Ser
      260      265      270
Gly Met Ser Leu Leu Asp Phe Arg Phe Gly Gln Lys Leu Arg Gln Val
      275      280      285
Leu Arg Asn Asn Ser Asp Asn Trp Tyr Gly Phe Asn Gln Met Ile Gln
      290      295      300
Asp Thr Ala Ser Ala Tyr Asp Glu Val Leu Asp Gln Val Thr Phe Ile
      305      310      315
Asp Asn His Asp Met Asp Arg Phe Met Ile Asp Gly Gly Asp Pro Arg
      320      325      330      335
Lys Val Asp Met Ala Leu Ala Val Leu Leu Thr Ser Arg Gly Val Pro
      340      345      350
Asn Ile Tyr Tyr Gly Thr Glu Gln Tyr Met Thr Gly Asn Gly Asp Pro
      355      360      365
Asn Asn Arg Lys Met Met Ser Ser Phe Asn Lys Asn Thr Arg Ala Tyr
      370      375      380
Gln Val Ile Gln Lys Leu Ser Ser Leu Arg Arg Asn Asn Pro Ala Leu
      385      390      395
Ala Tyr Gly Asp Thr Glu Gln Arg Trp Ile Asn Gly Asp Val Tyr Val
      400      405      410      415
Tyr Glu Arg Gln Phe Gly Lys Asp Val Val Leu Val Ala Val Asn Arg
      420      425      430
Ser Ser Ser Ser Asn Tyr Ser Ile Thr Gly Leu Phe Thr Ala Leu Pro

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435 440 445
 Ala Gly Thr Tyr Thr Asp Gln Leu Gly Gly Leu Leu Asp Gly Asn Thr
 450 455 460
 Ile Gln Val Gly Ser Asn Gly Ser Val Asn Ala Phe Asp Leu Gly Pro
 465 470 475 480
 Gly Glu Val Gly Val Trp Ala Tyr Ser Ala Thr Glu Ser Thr Pro Ile
 485 490 495
 Ile Gly His Val Gly Pro Met Met Gly Gln Val Gly His Gln Val Thr
 500 505 510
 Ile Asp Gly Glu Gly Phe Gly Thr Asn Thr Gly Thr Val Lys Phe Gly
 515 520 525
 Thr Thr Ala Ala Asn Val Val Ser Trp Ser Asn Asn Gln Ile Val Val
 530 535 540
 Ala Val Pro Asn Val Ser Pro Gly Lys Tyr Asn Ile Thr Val Gln Ser
 545 550 555 560
 Ser Ser Gly Gln Thr Ser Ala Ala Tyr Asp Asn Phe Glu Val Leu Thr
 565 570 575
 Asn Asp Gln Val Ser Val Arg Phe Val Val Asn Asn Ala Thr Thr Asn
 580 585 590
 Leu Gly Gln Asn Ile Tyr Ile Val Gly Asn Val Tyr Glu Leu Gly Asn
 595 600 605
 Trp Asp Thr Ser Lys Ala Ile Gly Pro Met Phe Asn Gln Val Val Tyr
 610 615 620
 Ser Tyr Pro Thr Trp Tyr Ile Asp Val Ser Val Pro Glu Gly Lys Thr
 625 630 635 640
 Ile Glu Phe Lys Phe Ile Lys Lys Asp Ser Gln Gly Asn Val Thr Trp
 645 650 655
 Glu Ser Gly Ser Asn His Val Tyr Thr Thr Pro Thr Asn Thr Thr Gly
 660 665 670
 Lys Ile Ile Val Asp Trp Gln Asn
 675 680

<210> 2
 <211> 2133
 <212> DNA
 <213> Geobacillus stearothermophilus

<400> 2
 atg aga aga tgg ott tog ota gto ttg ago atg toa ttt gta ttt agt 48
 Met Arg Arg Trp Leu Ser Leu Val Leu Met Ser Phe Val Phe Ser
 1 5 10 15
 gca att ttt ata gta tot gat acg cag aaa gto acc gtt gaa goa got 96
 Ala Ile Phe Ile Val Ser Asp Thr Gln Lys Val Thr Val Glu Ala Ala
 20 25 30
 gga aat ott aat aag gta aac ttt aca toa gat gtt gto tat caa att 144
 Gly Asn Leu Asn Lys Val Asn Phe Thr Ser Asp Val Val Tyr Gln Ile
 35 40 45
 gta gtg gat cga ttt gtg gat gga aat aca tcc aat aat cag agt gga 192
 Val Val Asp Arg Phe Val Asp Gly Asn Thr Ser Asn Asn Pro Ser Gly
 50 55 60
 gca tta ttt ago toa gga tgt acg aat tta cgc aag tat tgc ggt gga 240
 Ala Leu Phe Ser Ser Gly Cys Thr Asn Leu Arg Lys Tyr Cys Gly Gly
 65 70 75 80
 gat tgg caa ggc atc atc aat aaa att aac gat ggg tat tta aca gat 288
 Asp Trp Gln Gly Ile Ile Asn Lys Ile Asn Asp Gly Tyr Leu Thr Asp
 85 90 95
 atg ggt gtg aca gcg ata tgg att tot cag cct gta gaa aat gta ttt 336
 Met Gly Val Thr Ala Ile Trp Ile Ser Gln Pro Val Glu Asn Val Phe
 100 105 110
 tot gtg atg aat gat goa ago ggt tca gcc tcc tat oat ggt tat tgg 384
 Ser Val Met Asn Asp Ala Ser Gly Ser Ala Ser Tyr His Gly Tyr Trp
 115 120 125
 gog cgo gat ttc aaa aag cca aac cag ttt ttt ggt acc ctc agt gat 432
 Ala Arg Asp Phe Lys Lys Pro Asn Pro Phe Phe Gly Thr Leu Ser Asp
 130 135 140
 ttc caa cgt tta gtt gat goa oat goa aaa gga ata aag gta att 480
 Phe Gln Arg Leu Val Asp Ala Ala His Ala Lys Gly Ile Lys Val Ile

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145	150	155	160	
att gac ttt gcc ccc aac cat aot tot oot gct tca gaa acg aat oot				528
lle Asp Phe Ala Pro Asn His Thr Ser Pro Ala Ser Glu Thr Asn Pro	165	170	175	
tct tat atg gaa aac gga oga ctg tac gat aat ggg aca ttg ott ggc				576
Ser Tyr Met Glu Asn Gly Arg Leu Tyr Asp Asn Gly Thr Leu Leu Gly	180	185	190	
ggt tac aca aat gat gcc aac atg tat ttt oac cat aac ggt gga aca				624
Gly Tyr Thr Asn Asp Ala Asn Met Tyr Phe His His Asn Gly Gly Thr	195	200	205	
acg ttt tcc agc tta gag gat ggg att tat cga aat ctg ttt gac ttg				672
Thr Phe Ser Ser Leu Glu Asp Gly Ile Tyr Arg Asn Leu Phe Asp Leu	210	215	220	
gog gac ott aac cat oag aac oot gtt att gat agg tat tta aaa gat				720
Ala Asp Leu Asn His Gln Asn Pro Val Ile Asp Arg Tyr Leu Lys Asp	225	230	235	240
goa gta aaa atg tgg ata gat atg ggg att gat ggt atc ogt atg gat				768
Ala Val Lys Met Trp Ile Asp Met Gly Ile Asp Gly Ile Arg Met Asp	245	250	255	
gog gtg aag cac atg oag ttt gga tgg caa aaa tot ctg atg gat gag				816
Ala Val Lys His Met Pro Phe Gly Trp Gln Lys Ser Leu Met Asp Glu	260	265	270	
att gat aac tat ogt oot gto ttt aog ttt ggg gag tgg ttt ttg tca				864
Ile Asp Asn Tyr Arg Pro Val Phe Thr Phe Gly Glu Trp Phe Leu Ser	275	280	285	
gaa aat gaa gtg gao gog aac aat oat tac ttt gcc aat gaa agt gga				912
Glu Asn Glu Val Asp Ala Asn Asn His Tyr Phe Ala Asn Glu Ser Gly	290	295	300	
atg agt ttg ctc gat ttt ogt tto gga caa aag ott ogt caa gta ttg				960
Met Ser Leu Leu Asp Phe Arg Phe Gly Gln Lys Leu Arg Gln Val Leu	305	310	315	320
ogo aat aac agc gat aat tgg tat ggc ttt aat caa atg att caa gat				1008
Arg Asn Asn Ser Asp Asn Trp Tyr Gly Phe Asn Gln Met Ile Gln Asp	325	330	335	
acg goa tca gca tat gac gag gtt ctc gat caa gta aca tto ata gac				1056
Thr Ala Ser Ala Tyr Asp Glu Val Leu Asp Gln Val Thr Phe Ile Asp	340	345	350	
aac cat gat atg gat ogt ttt atg att gac gga gga gat ogt ogt aag				1104
Asn His Asp Met Asp Arg Phe Met Ile Asp Gly Gly Asp Pro Arg Lys	355	360	365	
gtg gat atg gca ott got gta tta ttg aca tcc ogt ggc gta ogt aat				1152
Val Asp Met Ala Leu Ala Val Leu Leu Thr Ser Arg Gly Val Pro Asn	370	375	380	
att tac tat ggt aca gag caa tac atg acc ggt aac ggc gat oca aac				1200
Ile Tyr Tyr Gly Thr Glu Gln Tyr Met Thr Gly Asn Gly Asp Pro Asn	385	390	395	400
aat ogt aag atg atg agt tca tto aat aaa aat aot ogt gog tat caa				1248
Asn Arg Lys Met Met Ser Ser Phe Asn Lys Asn Thr Arg Ala Tyr Gln	405	410	415	
gtg att caa aaa cta tct tct ctc oga oga aac aat ogt gog tta got				1296
Val Ile Gln Lys Leu Ser Ser Leu Arg Arg Asn Asn Pro Ala Leu Ala	420	425	430	
tat ggt gat acc gaa cag ogt tgg atc aat ggc gat gtg tat gtg tat				1344
Tyr Gly Asp Thr Glu Gln Arg Trp Ile Asn Gly Asp Val Tyr Val Tyr	435	440	445	
gag oga cag ttt ggc aaa gat gtt gtg tta gtt gcc gtt aat ogt agt				1392
Glu Arg Gln Phe Gly Lys Asp Val Val Leu Val Ala Val Asn Arg Ser				

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460

450	455		
toa ago agt aat tao tog att act ggo tta ttt aoa got tta ooa goa			1440
Ser Ser Ser Asn Tyr Ser Ile Thr Gly Leu Phe Thr Ala Leu Pro Ala			
465	470	475	480
gga aca tat acg gat cag ott ggo ggt ott tta gao gga aat aca att			1488
Gly Thr Tyr Thr Asp Gln Leu Gly Gly Leu Leu Asp Gly Asn Thr Ile			
485	490	495	
caa gto ggt toa aat gga toa gtt aat gca ttt gao tta gga oag ggg			1536
Gln Val Gly Ser Asn Gly Ser Val Asn Ala Phe Asp Leu Gly Pro Gly			
500	505	510	
gaa gto ggt gta tgg gca tao agt gca aca gaa agc acg ooa att att			1584
Glu Val Gly Val Trp Ala Tyr Ser Ala Thr Glu Ser Thr Pro Ile Ile			
515	520	525	
ggt cat gtt gga cag atg atg ggg caa gto ggt cat caa gta acc att			1632
Gly His Val Gly Pro Met Met Gly Gln Val Gly His Gln Val Thr Ile			
530	535	540	
gat ggc gaa gga tto gga aca aat acg ggc act gtg aag tto gga acg			1680
Asp Gly Glu Gly Phe Gly Thr Asn Thr Gly Thr Val Lys Phe Gly Thr			
545	550	555	560
aca gct gcc aat gtt gtg tct tgg tot aac aat caa atc gtt gtg gct			1728
Thr Ala Ala Asn Val Val Ser Trp Ser Asn Asn Gln Ile Val Val Ala			
565	570	575	
gta ooa aat gtg toa ooa gga aaa tat aat att acc gto caa toa toa			1776
Val Pro Asn Val Ser Pro Gly Lys Tyr Asn Ile Thr Val Gln Ser Ser			
580	585	590	
agc ggt caa acg agt gog gct tat gat aac ttt gaa gta ota aca aat			1824
Ser Gly Gln Thr Ser Ala Ala Tyr Asp Asn Phe Glu Val Leu Thr Asn			
595	600	605	
gat caa gtg toa gtg ogg ttt gtt gtt aat aac gog act acc aat cta			1872
Asp Gln Val Ser Val Arg Phe Val Val Asn Asn Ala Thr Thr Asn Leu			
610	615	620	
ggg caa aat ata tao att gtt ggc aao gta tat gag cto ggc aac tgg			1920
Gly Gln Asn Ile Tyr Ile Val Gly Asn Val Tyr Glu Leu Gly Asn Trp			
625	630	635	640
gao act agt aag gca atc ggt oca atg tto aat caa gtg gtt tao tco			1968
Asp Thr Ser Lys Ala Ile Gly Pro Met Phe Asn Gln Val Val Tyr Ser			
645	650	655	
tat oot aca tgg tat ata gat gto agt gto oca gaa gga aag aca att			2016
Tyr Pro Thr Trp Tyr Ile Asp Val Ser Val Pro Glu Gly Lys Thr Ile			
660	665	670	
gag ttt aag ttt att aaa aaa gac ago caa ggt aat gto act tgg gaa			2064
Glu Phe Lys Phe Ile Lys Lys Asp Ser Gln Gly Asn Val Thr Trp Glu			
675	680	685	
agt ggt toa aat cat gtt tat acg aca oca acg aat aca aoc gga aaa			2112
Ser Gly Ser Asn His Val Tyr Thr Thr Pro Thr Asn Thr Thr Gly Lys			
690	695	700	
att ata gtg gat tgg oag aac			2133
Ile Ile Val Asp Trp Gln Asn			
705	710		