

Accepted Article

Title: Stabilized Vanadium Catalyst for Olefin Polymerization by Site Isolation in a Metal-Organic Framework

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<http://dx.doi.org/10.1002/ange.201803642>

COMMUNICATION

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1 ? \$ 1 # 4 ; " 0 ' L / 3 / H , 6 + ' ; / & / @ B D & D ' " F F \$ % ' 6 3 , M 6 \$ ' D \$ % ; & , N , & B ' , 3 ' " 0 \$ F , 3 3
2 O " @ B + \$, A / & , " 3 - ' B \$ % / % \$ ' 6 3 H \$ % 6 & , G , A \$ H ' , 3 H 6 D & , / @ B ' " 4 , 3 8 ' & " ' 1 2 \$, % ' 0 " 3 4
3 D & / # , & B ' / 3 H ' O " % H 6 ; & , N , & B ') 5 \$ ' % \$ O " % & ' 1 2 \$ ' , + + " # , G , A / & , " 3 ' " F ' N / 3 / H , 6 3 5
4 # B ' ; / & , " 3 ' \$ P ; 2 / 3 8 \$ ' , 3 ' = Q R S T ! ' O " % N , H , 3 8 ' / ' + \$ & / @ S " % 8 / 3 ; ' F % / + \$ 4 " 0 6
5 4 , 1 2 ' N / 3 / H , 6 + , ' 3 ' / ' + " 0 \$; 6 ; \$ % , E \$ ' ; " % H , 3 / & , " 3 ' \$ 3 N , % " 3 + \$ 3 &) 1 2 3 7
6 + / & \$, % ' G ' F " % + D ' / ' D , 3 8 ; \$ % D , & \$ ' 2 \$ & \$ % " 8 \$ 3 \$ " 6 D ' ; / & / @ B D & ' 4 , 1 2 '
7 + \$ 1 2 B ; / @ 6 + , 3 " P / 3 \$ - ' O " % N , H , 3 8 ' O " @ B \$ 1 2 B ; \$ 3 \$ ' 4 , 1 2 ' 6 " 4 ' O " @ B H , D O \$ % D , & B '
8 U V ? < W X Y ' / 3 H ' 1 2 \$, 2 , 8 2 \$ D & ' / ; & , N , & B ' U 6 O ' & " ' Z T [- \ \ \ ' 2 % 1 2 Y ' % \$ O " % \$ H ' F " % / '
9 = ^ Q # / D \$ H ' O " @ B + \$, A / & , " 3 ' ; / & / @ B D &) Q 6 % 2 \$ % + " % \$ - ' O " @ B \$ 1 2 B ; \$ 3 \$ ' , D '
10 " # & / , 3 \$ H ' / D ' / ' F % \$ % \$ % 4 , 3 8 ' O " 4 H \$ % / D ' H \$ D , % \$ H ' , 3 H 6 D & , / @ B ') Q , 3 / @ B - ' 1 2 \$ '
11 ; / & / @ B D & ' D 2 " 4 D ' 8 " " H ' D & % G ; & 6 % / G , 3 & \$ 8 , & B ' / 3 H ' % \$ / , 3 D ' O " @ B + \$, A / & , " 3 '
12 / ; & , N , & B ' F " % " N \$ % ' _ T ' 2 " 6 D - ' # " 1 2 ' O " + , D , 3 8 ' / @ B , # 6 & \$ D ' F " % ' 1 2 \$ '
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14 L / 3 / H , 6 + ' ; / & / @ B D & D ' 2 / N \$ ' 6 " 3 8 ' # \$ \$ 3 ' E 3 " 4 3 ' & " " " F F \$ % '
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16 " F ' G , 8 2 ' " 0 \$ F , 3 D) ^ Z 1 2 \$ D \$ ' F \$ / & 6 % D ' 2 / N \$ ' + / H \$ ' 1 2 \$ + ' , 3 H , D O \$ 3 D / # ; \$,
17 & " ' 1 2 \$ ' + / 3 6 F / ; & 6 % \$ " F ' D O \$; / @ B ' \$ % / D & " + \$ % D) - 0 ' & \$ ' N / 3 / H , 6 3 0
18 ; / & / @ B D & D ' @ B O ; / @ B ' D 6 F F \$ % ' F % " + ' % / O , H ' H \$ / ; & , N / & , " 3 ' 6 3 H 4 0
19 O " @ B + \$, A / & , " 3 ' ; " 3 H , & (3 D) ^ X 0 * " 3 D \$ M 6 \$ 3 @ B - ' 1 2 \$, % ' 6 " 4 ' O " % H 6 ; & , N , & B ' 1
20 G , + , 1 2 ' 1 2 \$ ' ; " + + \$ % ; , / G , A / & , " 3 ' " F ' N / 3 / H , 6 + ' ; / & / @ B D & D ' & " 4 / H ' " 1 2 3 2
21 O " @ B (\$ F , 3 ' O " % H 6 ; 1 2 , D ' D 2 " % & ; " + , 3 8 ' 2 / D ' + & , N / & \$ H ' \$ P & \$ 3 D , N 3
22 \$ F F " % D ' & " " H \$ N \$ % ' O " + " % \$ ' D & / # \$ % ' / 3 H ' O " % H 6 ; & , N \$ ' N / 3 / H , 6 4 4
23 ; / & / @ B D & D - ' 4 , 1 2 ' 1 2 \$ ' + / > " % , & B ' " F ' 1 2 \$ D \$ ' D & 6 H , \$ D ' 6 D , 3 8 ' D " 6 6 # 1 5
24 + \$ & / @ B " 6 , 8 / 3 H ' ; " + O ; \$ P \$ D) ^ Z X 0 ,
25 9 ' ; / G , D D ; ' D & % / @ B 8 B ' & " " D & / # , G , A \$ ' " % 8 / 3 " + \$ & / @ B ; ' ; / & / @ B D & D ' 7
26 , 3 N " @ N \$ D ' , + + " # , G , A / & , " 3 ' " 3 1 " ' / ' D " G , H ' D 6 0 0 " % & - ' 4 2 \$ % \$, 3 ' D , 1 8
27 , D " 6 / & , " 3 ' + , 3 , + , A \$ D ' H \$ / ; & , N / & , " 3 ' 1 2 " 6 8 2 ' + 6 6 , + \$ / @ B ; 4 9
28 O / & 2 4 / B D) ^ T 0 ' Q 6 % 2 \$ % + " % \$ - D " G , H ' ; / & / @ B D & D ' / % \$ ' F & \$ 3 ' \$ M 6 , % \$ H ' F ' 5 0
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31 F " 6 ; 3 8 " 3 ' / G / % 8 \$ D ; / @ B) ^ a 0 1 " % \$ / G , A \$ ' 1 2 , D ' D & % / @ B 8 B ' 4 , 1 2 ' N / 3 / H , 6 5 3
32 / ' N / % , \$ B ' " F ' , + + " # , G , A / & , " 3 ' D & % / @ B 8 , \$ D ' 2 / N \$ ' # \$ \$ 3 ' D & 6 H , \$ H - ^ b 0 , # 6 4

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% \$ / & , N \$ @ B ' F \$ 4 ' \$ P / + O ; \$ D ' " F ' D , 3 8 ; \$ % D , & \$ ' 2 \$ & \$ % " 8 \$ 3 \$ " 6 D ' N / 3 / H , 6 + '
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; / & / @ B D & D ' " % \$, 3 ' O " @ B + \$, A / & , " 3 '

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6 , H , 3 8 ' 6 3 , 1 2 ' U d e R D Y ' " F & \$ 3 ' 6 3 H \$ 8 " " ; / & , " 3 ' \$ P ; 2 / 3 8 \$ ' 4 , 1 2
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O " D & B 3 1 2 \$ & ; ' + " H , F ; / & , " 3 ' " F ' = ^ Q ' d e R D)

5 , 1 2 ' / 3 , 3 & \$ % D & ' , 3 ' 6 D , 3 8 ' = ^ Q ' d e R D ' & " " D & / # , G , A \$ ' N / 3 / H , 6 + '
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= Q R S T ! ' U 1 3 a * G U e l ? ? Y x - ' f e l ? ? ' g ' # , D U Z " \$ Z - _ X S 0 % , / A " G " . T a S
0 - . T h - a h S , 0 Y H , # \$ 3 A " . Z - T 0 H , " P , 3 Y) ^ 0 3 1 2 \$ ' d e R ' " F ' 1 2 , D ' 8 % , / A " 0 \$ % # / D \$ H '
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/ & " + D - 0 1 / D ; " % O , " 3 / & \$ ' 6 3 , & ' D 2 " 4 3 ' & " D & 6 ; & 6 % / @ B ' / 3 H ' F 6 3 ; & , " 3 / @ B '
\$ + 6 G / & \$ ' 1 2 \$ ' & , D U O B / A " @ B Y # " % / & \$ - 0 1 / 3 H ' & , D U O B / A " @ B Y + \$ 1 2 / 3 \$ - 0 1
G , 8 / 3 H D ' 1 2 / & ' O " % N , H \$ ' \$ F F \$; & , N \$ ' N / 3 / H , 6 + ' ; / & / @ B D & D ' F " % " 0 \$ F , 3 '
O " @ B + \$, A / & , " 3 ' e / D \$ H ' " 3 ' 1 2 , D ' / 3 / G " 8 B ' # \$ 1 4 \$ \$ 3 ' d e R D ' / 3 H ' D + / @ B '
+ " 0 \$; 6 ; \$ - D ' 4 \$ ' / 3 & ; / O / \$ H ' 1 2 / & ' , 3 ; " % O " % / & , " 3 ' " F ' N / 3 / H , 6 + ' , 3 & " '
= Q R S T ! # B ' ; / & , " 3 ' \$ P ; 2 / 3 8 \$ ' 4 " 6 H ' O " % N , H \$ ' / 3 ' \$ F F \$; & , N \$ ' N / 3 / H , 6 + '
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j 3 ; " 6 % / 8 , 3 8 B - ; / & , " 3 ' \$ P ; 2 / 3 8 \$ ' 2 / D ' # \$ \$ 3 ' % \$ O " % \$ H ' , 3 ' = Q R S T ! '
4 , 1 2 ' D \$ N % / G ' 8 / 3 D , & , " 3 ' + \$ & / @ D - ^ Z k 0 / @ B 2 " 6 8 2 ' N / 3 / H , 6 + ' , D ' / # D \$ 3 & '
F % " + ' 1 2 , D ' D \$ % , \$ D ' / 3 H ' % / % ' F " % ; / & , " 3 ' \$ P ; 2 / 3 8 \$ ' , 3 ' = ^ Q D ' , 3 '
8 \$ 3 \$ % / G) ^ 0 1 I B O ; / @ B - ; / & , " 3 ' \$ P ; 2 / 3 8 \$ ' 4 , 1 2 ' = Q R S T ! , 3 N " @ N \$ D ' / '
G / % 8 \$ \$ P ; \$ D D ' U w a ' \$ M 6 , N / @ \$ 3 D Y ' " F ' 8 % / 3 D , & , " 3 ' + \$ & / G ' D / @ B) ' f " 4 N \$ % - '
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/ 0 ' ? %) 1) () * * + , & " - ' =) @ "% ABCDE , - V % " F) ? %) = , % ; \$ / ' ? , 3 ; J '
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c c ' = / D D / ; 2 6 D \$ @ D < 9 N \$ 3 6 \$ - ' * / + # , H 8 \$ - ' = / D D / ; 2 6 D \$ @ D \ _ Z X k - '
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V 6 % H 6 \$ ' R 3 , N \$ D , & B '
T [\ ' d & / H , 6 + ' = / @ B ' ?) ' 5 D & ' / F / B \$ % \$ - < 3 H , / 3 / T c k \ c - R 3 , & \$ H ' d & / & \$ D '
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' 9 % / + ; " ! d \$ % N ; \$ D ' * " + O / 3 B '
T \ \ ' 1 \$; 2 3 " 6 " 8 B ' d m 6 / % \$ - ' * / + # , H 8 \$ - ' = / D D / ; 2 6 D \$ @ D \ _ Z X k - R 3 , & \$ H '
d & / & \$ D '
H 0 ' () ' 9 ' @ \$ 2 0 '
' ? \$ O / % & + \$ 3 & " F " 2 \$ + , D & % B - ' j 6 8 \$ 3 \$ Q) ' = \$ % \$ % " 2 \$ + , D & % B ' * 3 \$ % \$ '
' e " D & " 3 " % \$ 8 \$ '
' _ b \ k ' e \$ / ; " 3 ' d & \$ % \$ - ' 2 \$ D & 3 6 & ' f , @ \ _ T b c - R 3 , & \$ H ' d & / & \$ D '
' d 6 0 0 " % , 3 8 ' , 3 F " % + / & , " 3 ' F " % 1 2 , D ' / % ; & \$ ' , D ' 8 , N \$ 3 N , / ' / G , 3 E ' / & 1 2 \$ \$ 3 H ' " F '
' 1 2 \$ % H ' ; 6 + \$ 3 &)

74 L * UOBYT-20' L * GxUI f QYx- ' " % L * Gt' H\$; " + O " D\$H' &2\$ = ^Q', 3100
75 ; /D\$D) ' o \$N\$%2\$;\$DD- ' N/3/H,6+ ' ,3; "%O"/&, "3' 4/D' "#D\$%N\$H\$
76 42\$3\$ \$/; 2' "F' &2\$D\$' &2\$D\$' O%; 6%D" %D' 4/D' 6D\$H' ,3' /' + 102
77 + "H\$D&' \$P; \$DD' U1 /#;\$Z'Y) ' 12\$ %SD6&,38' + /&\$%, /GD' D2" 4\$H' 8' 103
78 D&6; &6%/G' %\$3&, "3' #B' O" 4H\$ %pS% /B' H,FF/ ; &, "3' /3H' 8/D' D" %O 104
79 /3/BD, D' UD\$; &, "3' dXY- ; "3D, D&3&' 4, &2' &2\$' ,3; "%O"/&, "3' 105
80 N/3/H,6+ ,3&' /' D&6; &6%/GB' ; "3D\$%N\$H'F% / + \$4 "E) Q6%2\$ + " 106
81 /3/BD, D' "F' &2\$' D60\$3/ &/3&' ,3H, ; /&\$H' &2\$' %\$D\$/D\$' "F' A, 3; , 107
82 D" &6&, "3' ; "3D, D&3&' 4, &2' ; /&, "3' \$P; 2/38\$)' 108
83 B#\$(*A) * /&, "3' jP; 2/38\$' "F' N/3/H,6+ ,3&' = QRST!)

/; ; "63&D'F" %&2\$'F" % + /&, "3' "F' A- /' O"; ; \$DD' O\$N, "6D&B' %\$O" %&SH'F" %
&2\$' G, 8/ &, "3' "F' L * GxUI f QYx- ' 4, &2' 3, &8\$3\$#/D\$H' G, 8/3HD) = 0' eB'
; "3&/D&-&2\$' + /&\$%, /G' \$P; 2/38\$H' 4, &2' L * UOBYT- \$P2, #, &D' /3' \$H8\$'
\$3\$8B' + "D&' ; "3D, D&3&' 4, &2' N/3/H,6+ U<Y- /3H' ,D' %\$F\$%SH' &"'
2\$\$/F&\$%' /D' L "S=QRST! UCY)' * "3D, D&3&B- p\$#/3H' jV! /3/BD, D'
%SD6&SH' ,3' 3\$/%GB' ,H\$3&, /G' DO\$; &6%/F' "A' O%O/\$H' 4, &2' \$, &2\$%'
L * Gt' " %L * GxUI f QYx- ' 4, &2' 8' /3H' 9' &3D' %N/6SD' ; "3D, D&3&' 4, &2' /'
N/3/H,6+ U<LY' /DD, 83+ \$3&- 42, &6\$' C' \$P2, #, &SH' /' H, D, 3; &' jV! '
DO\$; &6+ 'Ud\$; &, "3' dZ\Y)

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Table with 5 columns: j3&B', L/3/H,6+' d"6%; \$, V% "H6; &, <3; "%O"/&, "3' ! /&, "UL' I' 13Y', jH8\$' j3\$8B-0'

<: -4(*D) j p9Qd'/3/BD, D' "F' A' /3H', &D' F, %D&SD2\$00' F, &)'
B#\$(*C) q6/3&, &/&, N\$ %SD6&D' "F' &2\$' j p9Qd' F, &)'

85 -/6 * "3H, & "3D1' * f x * o- " " + ' &\$ + O\$ / &6\$ - ' cS\Z \H/BD) ? \$&\$ + , 3\$H' #B' < * VS = d)
86 -/0 Q% " + N/3/H,6+ ' @ \$H8\$' p9d', 3'E\$L')
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Table with 7 columns: d / + O;\$, d; /&\$, 38' V/, %, * " "H) o6+ # \$, e "3H' : \$38&2' U rY', d, -', s j, ' U\$LY', t -' U r- Y'

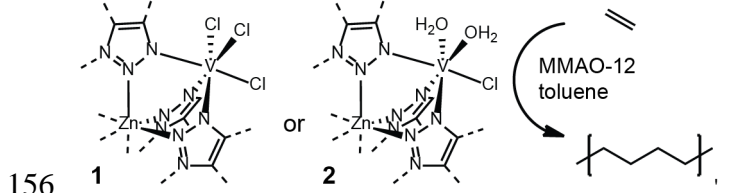
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89 <: -4(*C) * " + O/, D" 3' "F' &2\$' \$H8\$' \$3\$8, \$D' "#&, /3\$H' #B' N/3/H,6+ ' @ \$H8\$'
90 p9d' F" \$P; 2/38\$H' = ^QD' /3H' &2\$, %D&/3H/ %HD)'
91 I " ; 2/ % / ; &\$, A\$' &2\$' G" ; /G' D&6; &6\$' "F' N/3/H,6+ ,3' &2\$' = 102
92 4\$' 3\$P&' /3/BA\$H' &2\$' %SD6&, 38' + /&\$%, /GD' #B' N/3/H,6+ ' @ \$H8\$'
93 p9d- ' 4, &2' &2\$' &6, DUOB% /A" @BGY# " % /&\$' U1 O Y' ; " + O; \$P\$D' IOL * Gt'
94 IO_LeV2T- /3H' IO_L' D\$%N, 38' /D' D&/3H/ %HD' F" %L T' -' L' X' -' /3H' L
95 ,3' = QRST!) R3\$P0\$; &\$H&B- &2\$' + /&\$%, /GD' \$P; 2/38\$H' 4, &2' L * Gt' /3H'
96 4, &2' L * GxUI f QYx- ' D2" 4\$H' 3\$/%GB' ,H\$3&, /G' \$H8\$' \$3\$8, \$D' /3H' O\$S
97 \$H8\$' F\$ /&6\$' D' U1 /#;\$Z' -' \$3&, \$D' Z' /3H' _Y- # " &2' ; "3D, D&3&' 4, &2'
98 N/3/H,6+ U<LY' "P, H/ &, "3' D&/&\$' UQ, 86% _Y' /3H' %\$F\$%SH' &" ' 2\$\$/F&\$%'
99 /D' L "S=QRST! UAY) V%SD6+ /#&B- H, DO% "O" %&, "3/ &, "3' "F' L * GxUI f QYx-

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112 /0 12\$ /N\$ /8\$ \$% " % , 3' d, -', D' \) Z-, 3' # "3H' (\$38&2', D' \) X' r-, 3' s j, \, D' \) k' \$L' /3H'
113 ,3' s t-, D' \) \ \ _ r)'
114 Q6%2\$ + " % \$- /' OD\$6H" S"; &/2\$H%/G' 8\$' + \$&B' ; "6H' # \$'
115 /DD, 83\$H' F" % # " &2' A' /3H' C' #/D\$H' "3' /3/BD, D' "F' &2\$' O% \$H8\$'
116 F\$ /&6\$- # " &2' H, DO&/B, 38' O\$ /ED' "F' G' 4' & " + "H\$ /&\$' , 3&3D, &B'
117 UQ, 86% D' db) T\$ aY) = 0' I " ' F6&B' H\$D; %, # \$' &2\$' ; " %H, 3/ &, "3'
118 \$3N, % "3+ \$3&' "F' N/3/H,6+ -' 4\$' O\$ %F" % + \$H' /' F, %D&SD2\$00' F, &' "F' &2\$'
119 \$P&\$3H\$H' p\$S% /B' /#D' %O&, "3' F, 3\$' D&6; &6\$' U j p9QdY' H/ &' F" % A-
120 O% \$O/ %SH' 4, &2' L * Gt- ' "#&/, 3, 38' 8" "H' /8\$ \$ + \$3&' # \$&4\$3\$' &2\$'
121 \$PO\$, + \$3&/G' /3H' + "H\$ \$H' H/ &' UQ, 86% \$' X- I /#;\$ _Y) ' 12, D'
122 /3/BD, D' %SD6&SH' ,3' /' O%, + /%B' ; " %H, 3/ &, "3' DO2\$ \$'; "3D, D&38' "F'
123 X' o] L' # "3HD' U_) \c' rY' /3H' X' * G] L' # "3HD' U_) XZ' r- I /#;\$ _Y- /D'
124 /3&, ; O/ &\$H' F" % IOL * GxS&, E\$' D&6; &6\$' O% "O" D\$H' F" % A' U1 /#;\$ ZY)'
125 = "H\$D' 4, &2' H, FF\$ \$3&' ; " %H, 3/ &, "3' 36+ # \$D' 8/ N\$; "3D, D&3&B'
126 4 " %D\$' F, &D) ' 9&2 "682' /' D6, &/#;\$ F, %D&SD2\$00' j p9Qd' F, &' 4/ D' 3' &'
127 "#&/, 3\$H' F" % C- 4\$' O% "O" D\$' /' D, PS; " %H, 3/ & \$L' -' , 3N' %N, 38' &4 " '
128 D' %N\$3& + " &\$; 6\$D' U1 /#;\$ ZY' #/D\$H' "3' &2\$' %SD6&D' "F' \$H8\$' \$3\$8B-
129 O% \$H8\$' /3/BD, D- < ! /3H' \$ \$ + \$3&/G' /3/BD, D) ' I 26D' 4\$' O% "N, H\$' /'
130 H\$8\$ \$' "F' D&6; &6%/G' ; 2/ % / ; &\$, A/ &, "3' 8\$3\$ /GB' 3' &' O" DD, # \$' 4, &2'

131 0%, "2" 2\$1\$ "8\$3\$ "6D' N/3/H,6+' ; /&/BD&D' F" " 168
 132 O"GB+\$,A/&,"3" 3^c 42,;2"; "6H'8%\$/&B',3F"%+'+\$;2/3,D&,'/3/BD 169
 133 /3H'; /&/BD&D' "O&,+A/&,"3)" 170
 134 I" "N/6/&\$' \$2B:\$3\$' O"GB+\$,A/&,"3" # "2' A' /3H' C' 4\$ 171
 135 8%\$/&H' 4,2' \$2B:\$3\$' 63H\$% D:6%B' O2/D\$' ; "3H,&,"3D' 4,22
 136 + "H,F,\$H' +\$2B:/6+,"3/P/3\$S\$Z_ ' U=9^SZ_Y' /D' ; " ; /&/BD&D' 173
 137 U1/#\$' XY)' <3H\$H-' 4,2' # "2' + /&\$% /6D' 4\$' "#D\$%N\$ 174
 138 O"\$H" +,"3/3&B' 6,3\$/%' 2,82SH\$3D,&B' O"GB\$2B:\$3\$' /6\$' O"GB+\$ 175
 139 D2"4,38' /' 2,82' O\$/E' +\$6,38' &\$+O\$%/66%' U1_ uZX\ v*Y' 176
 140 + "H\$%/&\$' ;&BD;/6,3,&,\$D' Uw *Y' /D' +\$/D6\$H' #B' H,FF\$% 177
 141 D;/33,38' ;/6"%,+&\$B' U?d *Y)' f,82\$&+O\$%/66%' 8\$' O\$%+\$ /& 178
 142 ;2%'+ /&"8%/O2B' U f IS7V *Y' /3/BD,D' "F'2D\$D' O"GB+\$D' D2" 4\$ 179
 143 2,82' 36+ # \$%N\$/8\$' + "6\$;6/6%' 4\$,82& U=oy- 4,2' /' 4\$ 180
 144 H\$O\$3H\$3\$; \$' "F' =o. "3' \$2B:\$3\$' O%D\$D6\$' U\$3&,\$D' Z' /3H' 181
 145 Q6%2\$%+ "%\$' 2\$' 8\$3\$% /6B' 6" 4' O"GBH,DO\$D,&B' 3,H;,"D' UV 182
 146 +\$/D6\$H' /%\$' ; "3D,D&\$3& 4,2' D,38\$SD,&\$' ; /&/BD&D' "O\$% /& 183
 147 63H\$% 2\$' ; "3D&/,3&D' "F' + /DD' &/3D0 "%& e "2' A' /3H' C' D2" 4\$ 184
 148 D,83,F; /3& "%DO" 3D\$& "2BH% "8\$3' 4,2' /% "63H'Z' \SF" 6H'H\$; % 185
 149 ,3' 36+ # \$%N\$/8\$' + "6\$;6/6%' 4\$,82& U=oy' 60"3' 6" /H,38' 4,2 186
 150 ZIZ'+,P&6\$' "F' \$2B:\$3\$' /3H' 2BH% "8\$3' U\$3&,\$D' X' /3H' bY)' R3 187
 151 ; " +O' /#&\$' ; "3H,&,"3D-' 2\$' =o. "#&/,3SH' 4,2' A',D' 3\$% /6B' 2/6 188
 152 "#&/,3SH' 4,2' C-' 42\$% /D' 2\$' =o. "#&/,3SH' F" %D' +O;\$D' " 189
 153 O%\$O' /\$H' 6D,38' L *G_T' "% L *G_U I f QY_X' 4\$ \$D' ,+ /6' U\$3&,\$D' 190
 154 /3H'aY)' 191
 155 B#\$(*D)' I \$D6&D' "F' \$2B:\$3\$' O"GB+\$,A/&,"3' 4,2' A' /3H' C)' 192

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 O"GB+\$,A/&,"3" 3^c 42,;2"; "6H'8%\$/&B',3F"%+'+\$;2/3,D&,'/3/BD 169
 5 \$' 3\$P'D' 682& &" "O&,+A\$' 2\$' / ; &,N,&B' "F' A' #B', 3&\$% "8/,&,38' 170
 2\$' ; /&/BD&D' ; " +O'D,&,"3' /3H' %\$/ ; &,"3' ; "3H,&,"3D' UD\$; &,"3' dc) b\$[Y]' 171
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 ; "3D&/3&N/3/H,6+' /H,38' UO\$O' /%\$H' #B' L *G_U I f QY_X' \$P; 2/38\$-' 173
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 N/,"6D' /6EB;/6+,"36+D' U96=\$_x- 96j &x- 96,e6x- /3H' 96j & *6Y' 8,N\$' 175
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 4\$ \$N/6/&\$H' 2\$' \$FF\$; & "F' N/3/H,6+' /H,38' ,3' A' /& ; "3D&/3& 178
 =9^SZ_ ; "3; \$3&/ &,"3' /3H' / ; "3D&/3& 96' & "L' % / &," "F' X' \ \ ' I' Z' 179
 d' +O;\$D' "F' A' 4,2' 6" 4\$% N/3/H,6+' ; "3; \$3&/ &,"3' O" N,H\$H' 180
 ; "3D,D&\$3&B' 2,82\$% / ; &,N,&B' 12,D' 6" /H,38' \$FF\$; & / ; "63&D' F" % 2\$' 181
 /OO' /%\$3& H,FF\$%\$3; \$D',3' / ; &,N,&B' # \$4\$3\$' D' +O;\$D' "F' A' O\$O' /%\$H' 182
 4,2' L *G_U I f QY_X' /3H' 4,2' L *G_T- F\$ /66%,38',3\$M6,N/63&N/3/H,6+' 183
 6" /H,38' U1/#\$' XY)' Q6&2\$%+ "%\$' 2,D' 6" /H,38' H\$O\$3H\$3\$; \$' ,D' 184
 ; "3D,D&\$3& 4,2' + /DD' &/3D0 "%& \$; +, &\$H' / ; &,N,&B' /& 2\$' D6F/ ; \$' "F' /' 185
 2\$1\$ "8\$3\$ "6D' ; /&/BD&D' 96" 38' 2D\$D\$' 6,3SD-' 2\$' ; " + #,3/ &,"3' "F' A' 186
 /3H' == 9^SZ_ D2" 4D' /3' /OO' /%\$3& F,%D&\$%H\$% H\$O\$3H\$3\$; \$' "F' 187
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 O," %& = ^Q' ; /&/BD&D' F" %\$F,3' O"GB+\$,A/&,"3)" -Zx-ZT0' 192



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\$3&B'	= ^Q'	V ₁ ^{+/3}	V ₁ ^{-/3}	I ^Q [#]	w * -:3+	V? < ^{H3}	= 1 [#]
U4w'LY'		U# /%Y'	U# /%Y'	U2% 12Y'			UxZ \ ^Y'
Z'	A ^{S0} Uz)aw'LY'	T\'	\'	cZ-\ \ \'	b_w'	X)T'	ba\'
_'	A ^{S0} Uz)aw'LY'	Z\'	\'	aZ-\ \ \'	b_w'	X)a'	XX\'
X'	A ^{S0} Uz)aw'LY'	Z\'	Z\'	_-\ \ \'	[Zw'	Xb'	X)['
T'	A ^{Ri} U_)aw'LY'	Z\'	\'	c-a\ \ \'	akw']c'	X[\ \'
a'	C*Uz)[w'LY'	Z\'	\'	b-T\ \ \'	bbw']k'	b[\ \'
b'	C*Uz)[w'LY'	Z\'	Z\'	k\ \ \'	c\w'	c\'	T)X'

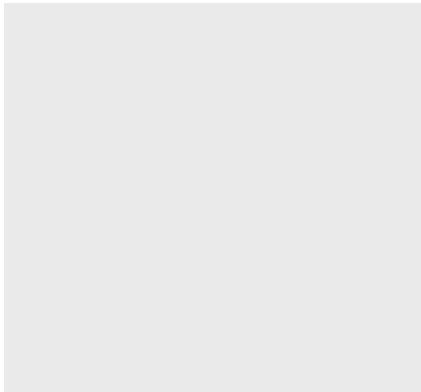
157 -/6 900;\$H' O%D\$D6\$' "F' \$2B:\$3\$' U j Y' /3H' 2BH% "8\$3' U f _Y)' 163 "N\$' F\$M6\$3; B',3' 158
 + "6U\$2B:\$3\$' x+ "6U' O\$% 2" 6)" :3? \$4\$%+,"3SH' #B' ?d *Y)' :H? \$4\$%+,"3SH' #B' f IS 159
 7V *Y)' :5V %\$O' /%\$H' 4,2' L *G_U I f QY_X' :5V %\$O' /%\$H' 4,2' L *G_T)' 160
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 O"BO" O"OB:\$3\$' ,3' 6" 4' / ; &,N,&B)' * "3D,D&\$3& 4,2' 2,D' %SD6&-D' 66# 198
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 &/ ; &,"&B' 2& /3' 2\$% ; 2%'+,6+' "% &,&/3,6+' /3/6" 86SD)^ 1" 200
 E3" 4\$H8\$% 2,D',D' 2\$' F,%D& = ^QS# /D\$H' ; /&/BD&D' /3H' 2\$' 201
 202

*
 !; E (. (*A)' <D' D\$& ; &,N\$' O"GB+\$,A/&,"3' "F' O"OB:\$3\$' 6D,38' A' U L *G_T\$SP; 2/38\$Y)'
 <:-4(*F)' I,+ \$' D&6B' "F' \$2B:\$3\$' O"GB+\$,A/&,"3' 4,2' A' U L *G_U I f QY_X' \$P; 2/38\$Y)'
 * "3D,D&\$3& 4,2' 2\$1\$ "8\$3\$ "6D' ; /&/BD,D-' O"GB\$2B:\$3\$' 4/D' 1
 O"\$H" +,"3/3&B' "#&/,3SH' /D' /' F%\$S\$F6" 4,38' O" 4H\$% 6D,38' A' /3H' C-' 1
 /D' HSD,%\$H' F" % ; " + + \$% ; /6' O"GB+\$,A/&,"3)" eB' ; "3&/D&- 2\$' 1
 ; " + #,3/ &,"3' "F' IOL *G_X' "% L *G_T' 4,2' =9^SZ_ F" % + 1
 2" + "8\$3\$ "6D' D' 6&,"3D',3' &"66\$3\$' O"GB+\$,A,38' \$2B:\$3\$' /D' /' 1
 D' 6,H' + /DD' F,%&B' /&/ ; 2\$H' &" 2\$' %\$/ ; &" % 4 /6' UD\$; &,"3' dc) ZX)Y)' 1

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* ^ = = R o < * 9 | < ^ o '

L / 3 / H, 6 + ' ; / & / @ B D & D ' O % " N, H \$ ' ; " N \$ & \$ H '
D \$ \$ \$; & , N, & B ' , 3 ' " C \$ F, 3 ' O " @ B + \$ % , A / & , " 3 - # 6 & '
D 6 F F \$ % ' F % " + ' O " " % ' D & / # , @ , & B ' / 3 H '
O % " H 6 ; & , N, & B) < 3 ' & 2, D ' % \$ O " % & '
, 3 ; " % O " % / & , " 3 ' " F ' N / 3 / H, 6 + ' , 3 & " ' / '
+ \$ & / @ S " % 8 / 3 ; ' F % / + \$ 4 " % E ' O % " N, H \$ D ' / '
D, 3 8 : \$ \$ D, & \$ ' 2 \$ & \$ % " 8 \$ 3 \$ " 6 D ' ; / & / @ B D & '
4, & 2 ' \$ P ; \$ O & , " 3 / G ' / ; & , N, & B ' / 3 H ' D & / # , @ , & B '
F " % ' \$ & 2 B : \$ 3 \$ O " @ B + \$ % , A / & , " 3 ' p \$ % / B '
/ # D " % O & , " 3 ' D O \$; & " D ; " O B ' / 3 / @ B D, D '
O % " N, H \$ D ' \$ N, H \$ 3 ; \$ ' F " % ' / ' H, D ; % \$ & \$ - '
+ " C \$; 6 : \$ \$; E \$ ' ; " " % H, 3 / & , " 3 " ' F ' L ' T ' 1 '
; / & , " 3 D ' , 3 ' & 2, D ' + / & \$ % , / G ')'



* - # ' . G \$ H) \$ % - (7 6 - U \$ V & ' 3 E ' 7 \$ W ? U \$
X ? 8 3 = & ? 7 \$ V & 8 3 = J \$ H - & 3 \$ @) \$ M 8 E . ' 3 4 ' \$ F F F U \$
J 8 4 7 ' V \$ S) \$ Z - . [5 \ Q P 7 U \$ H ' 9 9 . ' 5 \$ @) \$ Z ' & ; U \$
H ' 9 9 . ' 5 \$ <) \$ J 7 ! ! ' . U \$ J 7 . 4 ' 8 \$ S 7 3 4] ^ \$

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! " # \$ % & ' () * + # , #) % - . * / # # i 0 1 " * 2 3 4 *
5 & (2 % , * 6 3 i 0 . (4 % " # " % 3 , * \$ 0 * ! " " (*
7 1 3 i # " % 3 , * % , * # * 8 (" # i 9 5 4 : # , % ; *
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