

**SUPPLEMENTARY MATERIALS**

**Table S1. Nucleotide sequences of synthesized genes used in this study**

<b>Gene</b>	<b>Sequence (5'-3')</b>
<i>CHL27</i>	ATGAGCGCCAGCTCTTCTCCACCTCCTCCAACACTGCCACGAGCAAGTCAAAGAAAGGTAC AAAAAAGGAGATACAAGAATCCCTGTTGACGCCTCGTTTTTACACTACCGATTTTGAGGAGA TGGAGCAGTTGTTTTAACACTGAGATAAAACAAAAATCTTAATGAAGCCGAGTTTGAAGCTCTT TTACAAGAGTTTAAAACCGATTATAACCAAACCTCATTTTCGTCCGGAATAAGGAGTTCAAGGA AGCAGCTGACAACTTCAGGGTCCTTTACGTCAAATTTTCGTGGAATTCCTGGAGAGATCAT GTACCGCTGAGTTTTTCGGGATTCTTGCTGTACAAGGAACCTGGTTCGGCGCCTGAAGAAAACC AACCTGTAGTTGCAGAGATTTTCTCCTTGATGAGCCGCGACGAAGCAAGACACGCGGGCTT TTTAAATAAAGGTTTGAGCGATTTTAATTTGGCGCTTGATTTAGGGTTTCTTACCAAAGCCC GCAAATATACTTTTTTCAAACCGAAATTCATTTTTTACGCGACTTATCTTAGCGAAAAGATA GGTTACTGGCGCTACATAACAATTTATCGCCACTTAAAAGAAAATCCGGAGTTCCAGTGTTA TCCGATCTTCAAATACTTCGAGAACTGGTGCCAAGATGAAAATCGGCATGGCGACTTCTTCT CCGCCCTGATGAAGGCGCAGCCTCAATTTTTTAAATGACTGGCAGGCAAAAACCTGTGGAGCCGC TTCTTCTGCTTGAGCGTATACGTACAGATGTACTTAAATGATTGCCAGCGTACAAAATTTTAA TGAGGGTATTGGGCTTAACACCAAAGAGTTTGATATGCATGTTATAATCGAGACGAACCGGA CTACGGCTAGAATATTTCTGCCGTATTAGACGTGGAGAATCCAGAATCAAACGCAAACCTT GATCGTATGGTGGTCTCGTATGAGAAGTTACTTGCGATAGGAGAGACAGATGATGCAAGTTT CATCAAACATTGAAACGTATCCCCTGGTTCACATCATTGGCCTCCGAGATCCTGGCGGCAT ACTTGATGCCGCCAGTAGAATCCGGTTCTGTAGATTTTGTGAGTTCGAGCCAAATTTGGTC TACTAA
<i>YCF54</i>	ATGTCAACGAAATATCATTTTTTTGGTAGCAAATGCCAAATTTATGTTGGATGAAGAGGAGCA TTTCCAAGAGCAATTAATTTGAGCGCCTTCGGTATTTTCGGAGAGCGGGAACCTGGTACAAGATT TTTGGCTGGTCATTGAACCCAAATTCCTGGATAATTTCCCAAGATAACCCAACGCTTGCGG CGGCCAGCCGTAGCGCTTGTACGACTAATGGAACGTGGATCACCTTTATGAAGCTGCGTCT GGACCGGTGCTGTACGACTCGTTCGAAGCCACATCGTTAGATGAGGCGCTTGCGAGTAATC CTACCACGCTTGAATTTGATAAGCCTAAGAATTGGGTAGCGCCGTATCCGAAGTACGAGCCA GGCTGGTGGGATACCTTTTTGCCGAAGGTCACGCAAGAGTCCGCCGTCTAA
<i>CRD1</i>	ATGGTACAAGCAAGCGCGGCCCGCTTAACGACGGTTTTGGGGTTCGAAACGATGCGTGACGG TATCAAAGTGGCCGCTAAGGAAACGTTGCTTACACCACGGTTTTTATACGACGGACTTTGACG AAATGGAGCAACTGTTCTCTAAGGAAATTAACCCAAACCTTGACATGGAAGAGCTGAACGCA TGTCTTAATGAATCCGTAACGATTACAATAAGGTTCACTTCGTCCGGAATGAAACGTTTAA AGCCGCTGCGGACAAGGTAACAGGGGAGACACGATATATTATTGATTCCTTGAGCGGT CTTGCACGCGCAGAGTTTTTCGGGCTTCTTGTATATAAAGAGTTGGCTCGGCCGATGAAAGCC AGCAGCCCGGAGGTAGCTGAGATGTTCTTGCTTATGTCCCGGACGAGGCCCGTCATGCAGG GTTTTCTTAAACAAGGCTTTGTGCGATTTTAACTTGCCTTAGACCTTGGGTTTTCTTACAAAAG ATAGAACCTACACGTACTTTAAACCGAAATTTATCATTTATGCTACATTTTTTAAAGCGAAAAG ATAGGGTACTGGAGATATATAACCATATATCGGCACCTGCAACGTAATCCGGACAATCAGTT CTATCCCCTTTTTGAATACTTCGAAAACCTGGTGCCAGGATGAAAACCGCCACGGTGATTTCC TGGCAGCATGCCTTAAAGCGAAGCCCGAACTTTTGAACACCTTCGAAGCAAAGCTGTGGAGC AAGTTTTTTTTGCTTAAAGCGTATATATTACAATGTATTTGAACGATCACCAACGCACCAAAT CTATGAATCTCTTGGGTTGAATACTCGTCAATTCACCAACATGTCATTATAGAAACCAACC GCGCTACCGAAAGATTGTTTTCCAGTCGTGCCTGACGTTGAAGATCCGAGATTTTTTCGAAATC CTTAATAAAATGGTGGATGTGAATGCCAAGCTGGTAGAGTTAAGTGCCTCGTCCAGCCCACT TGCTGGACTTCAAAGTTACCCCTTTTAGAGCGGATGGCCTCGTACTGCTTACAACTTTTGT TTTTTAAAGGAAAAGGACGTCGGATCGGTAGATATCGCCGGGAGTGGCGCTTCGAGAAAACCTA GCTTACTAA
<i>CTH1</i>	ATGGTGGCGGCAACAGCCGCGCCACAGGAAGTAGAAGGTTTTAAAGTTATGCGCGACGGCAT TAAAGTGGCCTCCGACGAAACGCTTTTAAACACCCCGTTTCTATAACACTGATTTTGACGAGA TGGAGCGTCTTTTTAGTCTTGAGTTGAACAAGAATATGGACATGGAAGAGTTCGAAGCCATG TTGAATGAATTAAGTTGATTATAATCAACGCCACTTTGTTTCGCAATGAGACGTTTAAAGA AGCGGGGAAAAGATCCAAGGACCCACACGTAATAATCTTTATTGAGTTTCTTGAGCCTTCCCT GTACAGCAGAGTTCTCTGGATTTTTACTGTATAAGGAACTGGGACGTCGCCTGAAAGCTACG AACCCAGTAGTAGCCGAAATTTTACGCTTATGTGCGCGACGAAGCACGTCATGCTGGTTTT TTTTGAATAAAGCGATGTCCGATTTTAAATTTGGCACTTACTTAGGTTTTCTTGACTAAGAACC GTAAATATACTTTCTTCAAACCTAAATTCATCTTTTACGCCACATACTTATCCGAGAAAATC

	GGTTATTGGCGCTATATCAGTATCTACCGCCACCTGCAGCGCAATCCAGACAACCAATTGTA CCCCTTATTCGAATATTTTGAGAACTGGTGTCAAGACGAAAACCGTCATGGTGACTTTTTCA CTGCCGTCCTGAAAGCACGCCCCGAAATGGTCAATGATTGGGCAGCGAAACTGTGGTCACGC TTCTTCTGCCTTAGTGTATACATTACGATGTACTTGAATGATCACCAACGTGACGCATTTTA TAGCTCCCTGGGGCTGAACACAACGCAATTTAATCAACACGTGATCATTGAAACTAATAAAT CGACAGAGCGTATTTTCCCTGCTGTGCCAGATGTGGAAAATCCTGAGTTTTTTTCGCCGTATG GACTTGTGGTGAATACAACGCACAACCTGGTGAACATTGGCTCAATGAACTTGCCTTCTCC CATTAAAGCAATTATGAAAGCACCTATCTTAGAACGCATGGTCGCGGAAGTCTTTCAAGTAT TTATTATGACGCCGAAAGAGAGCGGTTTCGTATGATCTTGATGCCAACAAGACAGCTCTTGTA TATTAA
<b>CGL78</b>	ATGCCTGCTCCAGCAGCTGCTTCAGCCGATAAAGCAACAGCGGCCGAATACTACGCCCTTGT CTGCAACGCCGAATGGTTCTTCATGGACCCGAAAACGAGTCGGTTGCTGAACAATTGAGAG AGAAGGTAAGATTCTTCAAAGAGCAGAACAAGAACGGGATTTCTTCATCGTGCCAAATCCC AAGTGGCTGGACGCCAAGTTCCCGAACAGGCTAAGCAAGTCAAAGACCATGCGTAGCGCT GGTCAGTACCGACAAAATGTGGATTACATTCATGAAGTTGCGCTTGGACCGTGTGTTGAAGA TCGACTTAAAAAGTATGCCAGCGAGCGAGGTCCTTGC GGCTGGGGAAGCATTGCCGGATTC AAGCCGGACGAAAGTGGACAGCGCCGTATGCCAGATACACTCCCGGTTGGTGAATGTATT TCTGCCTAATCATTAA

**Table S2. Primers used in this study**

<b>Primer</b>	<b>Sequence (5'-3')</b>
cyclBglII_F	GAGTCTAGATCTATGGTTAATACCCCTCGAAAAGCCC
cyclNotI_R	GAGTCTGCGGCCGCTTAGCGCACAGCTCCAGCCAAC
ycf54NotI_R	GAGTCTGCGGCCGCTAATCCAGGGATGCAAGGGGGT
CHL27BglII_F	GAAAGATCTATGAGCGCCAGCTCTTCTCC
CHL27XhoI_R	GAACTCGAGTTAGTAGACCAAATTTGGCTCGAA
CHL27rbsYCF54_F	AGCCAAATTTGGTCTACTAATATAGGAGCTTGGATTATGTCAACGAAATATCATT
CHL27rbsYCF54_R	AATGATATTTTCGTTGACATAATCCAAGCTCCTATATTAGTAGACCAAATTTGGCT
YCF54XhoI_R	GAACTCGAGTTAGACGGCGGACTCTTGCG
CHL27NdeI_F	GGAACATATGAGCGCCAGCTCTTCTCC
CHL27SpeI_R	GGAAACTAGTTTATAGTAGACCAAATTTGGCTCG
YCF54NdeI_F	GGAACATATGTCAACGAAATATCATTTTTTTGGTA
YCF54SpeI_R	GGAAACTAGTTTATAGACGGCGGACTCTTGCG
YCF54truncSpeI_R	GGAAACTAGTTTAATTACTCGCAAGCGCCTC
CRD1NdeI_F	GGAACATATGGTACAAGCAAGCGCGGCC
CRD1SpeI_R	GGAAACTAGTTTATAGTAAGCTAAGTTTCTCGAAG
CTH1NdeI_F	GGAACATATGGTGGCGGCAACAGC
CTH1SpeI_R	GGAAACTAGTTTAATATAACAAGAGCTGTCTTGT
CGL78NdeI_F	GGAACATATGCCTGCTCCAGCAGCTGCTT
CGL78SpeI_R	GGAAACTAGTTTAATGATTAGGCAGAAATACAT

**Table S3. Strains and plasmids described in this study**

Strain/Plasmid	Description	Source
<b><i>E. coli</i></b>		
JM109	Cloning strain for plasmid constructs	Promega
S17-1	Conjugation strain for pBBRBB- <i>Ppuf</i> <sub>843-1200</sub> constructs	[1]
C43(DE3)	Expression strain for <i>in vivo</i> cyclase assays	[2]
<b><i>Rvi. gelatinosus</i></b>		
IL144	WT strain	S. Nagashima*
$\Delta bchE\Delta acsF$	Unmarked deletion mutant of <i>bchE</i> and <i>acsF</i> in WT	[3]
$\Delta bchE\Delta acsF$ <i>Rif</i> <sup>R</sup>	Spontaneous rifampicin resistant mutant isolated from $\Delta bchE\Delta acsF$	This study
<b>Plasmid</b>		
pBBRBB- <i>Ppuf</i> <sub>843-1200</sub>	Expression vector carrying the 843–1200 region of the <i>puf</i> promoter of <i>Rba. sphaeroides</i> , Km <sup>R</sup>	[4]
pBB[ <i>acsF</i> ]	<i>Rvi. gelatinosus acsF</i> gene cloned into BglII/NotI sites of pBBRBB- <i>Ppuf</i> <sub>843-1200</sub>	[5]
pBB[ <i>cycl</i> ]	<i>Synechocystis cycl</i> gene cloned into BglII/NotI sites of pBBRBB- <i>Ppuf</i> <sub>843-1200</sub>	This study
pBB[ <i>cycl-ycf54</i> ]	<i>Synechocystis cycl-ycf54</i> genes cloned into BglII/NotI sites of pBBRBB- <i>Ppuf</i> <sub>843-1200</sub>	This study
pBB[ <i>CHL27</i> ]	Synthesized gene encoding <i>Arabidopsis</i> CHL27 cloned into BglII/XhoI sites of pBBRBB- <i>Ppuf</i> <sub>843-1200</sub>	This study
pBB[ <i>CHL27-YCF54</i> ]	Synthesized genes encoding <i>Arabidopsis</i> CHL27 and YCF54 cloned into BglII/XhoI sites of pBBRBB- <i>Ppuf</i> <sub>843-1200</sub>	This study
pET3a	Expression vector carrying T7 promoter, Amp <sup>R</sup>	Novagen
IM	<i>Synechocystis chlI, chlD, chlH, gun4</i> and <i>chlM</i> genes cloned into pET3a sequentially using link and lock method	[5]
IA	<i>Rvi. gelatinosus acsF</i> gene cloned into IM	[5]
IM- <i>cycl</i>	<i>Synechocystis cycl</i> gene cloned into IM	[5]
IM- <i>cycl-ycf54</i>	<i>Synechocystis ycf54</i> gene cloned into IM- <i>cycl</i>	[5]
IM- <i>CHL27</i>	Synthesized gene encoding <i>Arabidopsis</i> CHL27 cloned into IM	This study
IM- <i>CHL27-YCF54</i>	Synthesized gene encoding <i>Arabidopsis</i> YCF54 cloned into IM- <i>CHL27</i>	This study

IM-CRD1	Synthesized gene encoding <i>Chlamydomonas</i> CRD1 cloned into IM	This study
IM-CRD1-CGL78	Synthesized gene encoding <i>Chlamydomonas</i> CGL78 cloned into IM-CRD1	This study
IM-CTH1	Synthesized gene encoding <i>Chlamydomonas</i> CTH1 cloned into IM	This study
IM-CTH1-CGL78	Synthesized gene encoding <i>Chlamydomonas</i> CGL78 cloned into IM-CTH1	This study
IM-CHL27-ycf54	<i>Synechocystis ycf54</i> gene cloned into IM-CHL27	This study
IM-CRD1-ycf54	<i>Synechocystis ycf54</i> gene cloned into IM-CRD1	This study
IM-cycl-YCF54	Synthesized gene encoding <i>Arabidopsis</i> YCF54 cloned into IM-cycl	This study
IM-cycl-CGL78	Synthesized gene encoding <i>Chlamydomonas</i> CGL78 cloned into IM-cycl	This study
IM-CHL27-YCF54*	Synthesized gene encoding <i>Arabidopsis</i> YCF54 with C-terminal 37 aa truncated (YCF54*) cloned into IM-CHL27	This study

\*Research Institute for Photosynthetic Hydrogen Production, Kanagawa University, Yokohama, Japan.

†School of Life Sciences, Arizona State University, AZ 85281.

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