

Supplementary Information

Figure 1. Comparison of the metabolic profiles of the three cyanobacterial strains plus additional Synechocystis strain, namely, PCC7002, PCC7942, PCC6803 and PCC6714 under photoautotrophic conditions. Z-scored data were hierarchically-clustered and the results are represented with a heat map.

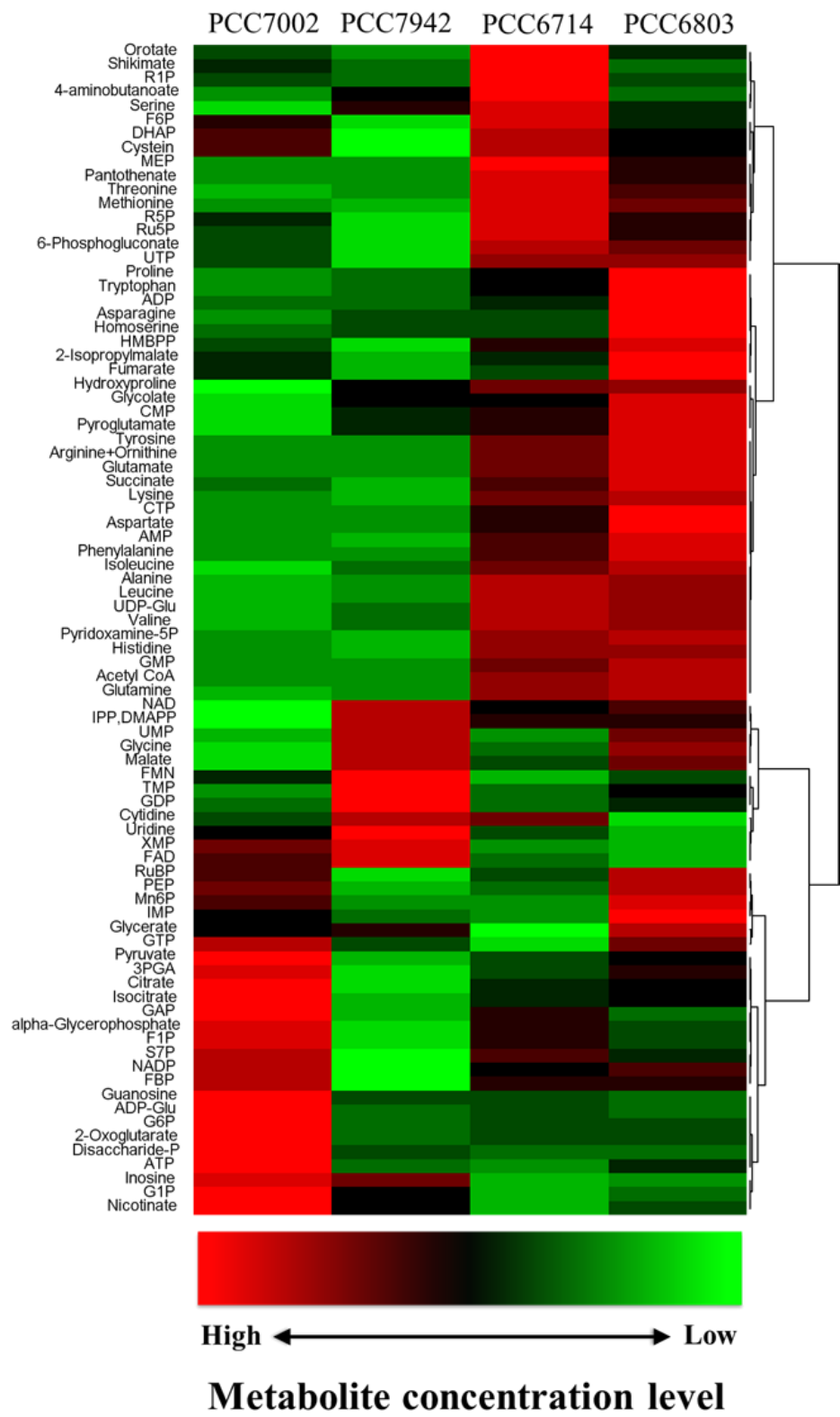


Figure 2. Comparison of adenylate energy charge and growth rate in four strains. The bar graphs indicate the mean values of triplicates and error bars indicate the standard deviation. Pearson correlation coefficient by using all four mean values is 0.906.

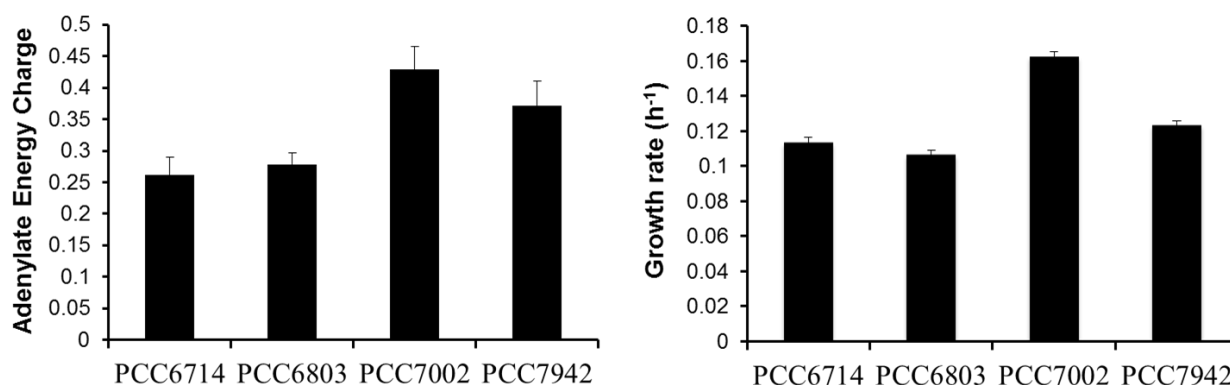


Table 1. The quantitation result of *Synechocystis* sp. PCC6714. The values indicate the mean of triplicates in $\mu\text{mol/g}$ -drycell weight and S.D. represents standard deviation.

Metabolite	Average	S.D.	Metabolite	Average	S.D.
2-Isopropylmalate	1.48E-01	2.47E-02	Glutamine	3.33E+00	3.12E-01
2-Oxoglutarate	3.42E-01	8.26E-02	Glycerate	1.37E-02	2.14E-03
3PGA	1.12E+01	1.82E+00	Glycine	7.05E+00	6.33E-01
4-Aminobutanoate	2.41E-02	5.34E-03	Glycolate	5.29E-02	1.15E-02
6-Phosphogluconate	5.64E+00	6.73E-01	GMP	6.63E-01	1.09E-01
Acetyl CoA	4.13E-01	5.08E-02	GTP	8.51E-02	1.47E-01
ADP	3.10E+00	2.36E-01	Guanosine	1.12E-01	2.56E-02
ADP-Glc	1.13E-01	7.02E-02	Histidine	1.08E-01	3.14E-03
Alanine	4.79E+00	1.02E+00	HMBPP	6.72E-02	2.50E-02
α -Glycerophosphate	6.24E-01	7.70E-02	Homoserine	1.59E-02	2.14E-03
AMP	7.89E+00	7.38E-01	Hydroxyproline	8.77E-01	1.73E-01
Arginine + Ornithine	1.59E+01	3.77E+00	IMP	1.18E-01	5.08E-02
Asparagine	1.04E-01	1.18E-02	Inosine	9.14E-03	1.50E-03
Aspartate	4.65E+00	7.86E-01	IPP + DMAPP	1.39E-02	3.60E-03
ATP	1.80E+00	3.12E-01	Isocitrate	1.11E+00	4.67E-02
Citrate	1.90E+00	2.24E-01	Isoleucine	3.02E-01	4.86E-02
CMP	2.85E-01	4.39E-02	Leucine	8.26E-01	1.48E-01
CTP	3.11E-01	8.63E-02	Lysine	1.42E-01	2.47E-02
Cystein	6.22E-01	3.41E-01	Malate	1.20E-01	1.52E-02
Cytidine	2.91E-02	4.83E-03	MEP	1.36E-01	2.95E-02
DHAP	6.47E-01	9.46E-02	Methionine	7.57E-01	1.19E-01
Disaccharide-P	0.00E+00	0.00E+00	Mn6P	2.03E-01	1.62E-01
F1P	1.40E-02	2.80E-03	NAD	4.85E-01	3.41E-02
F6P	6.89E-01	5.95E-02	NADP	5.73E-01	8.69E-02

FAD	1.13E-01	8.14E-03	Nicotinate	1.99E-04	2.03E-05
FBP	2.50E-01	8.28E-02	Orotate	2.92E-02	7.73E-03
FMN	4.61E-02	1.10E-02	Pantothenate	9.20E-03	3.24E-03
Fumarate	7.72E-02	2.92E-03	PEP	1.71E+00	2.11E-01
G1P	5.26E-02	5.90E-03	Phenylalanine	1.48E-01	2.87E-02
G6P	1.91E+00	5.04E-01	Proline	3.30E-01	5.23E-02
GAP	3.84E-01	4.50E-02	Pyridoxamine-5P	4.53E-02	6.92E-03
GDP	8.25E-01	1.30E-01	Pyroglutamate	1.99E+00	3.63E-01
Glutamate	1.59E+02	3.69E+01	Pyruvate	8.02E+00	9.53E-01
R5P	2.80E-01	6.46E-02	R1P	2.04E-02	2.24E-03
Ru5P	2.04E-02	1.31E-01	Tryptophan	2.24E-03	2.11E-02
RuBP	2.80E-01	2.27E+00	Tyrosine	6.46E-02	4.19E-01
S7P	6.46E-01	2.31E+00	UDP-Glc	5.14E-02	3.78E-01
Serine	1.57E-01	6.20E-01	UMP	2.76E-02	1.26E-01
Shikimate	4.57E+00	4.15E-02	Uridine	5.10E-01	8.48E-03
Succinate	1.35E+00	5.31E-01	UTP	1.00E-01	2.83E-02
Threonine	3.75E-03	1.08E+00	Valine	1.99E-03	1.83E-01
TMP	2.83E-01	5.02E-02	XMP	3.35E-02	8.01E-03

Figure 3. Growth curves in *Synechococcus elongatus* PCC7942, *Synechococcus* sp. PCC7002, *Synechocystis* sp. PCC6803 and *Synechocystis* sp. PCC6714 at 30 °C under fluorescent light (85-90 $\mu\text{mol}/\text{m}^2 \cdot \text{s}$) and 1% CO_2 -Air. The bar graphs indicate the mean values of triplicates and error bars indicate the standard deviation. Growth was monitored by the optical density at 730 nm.

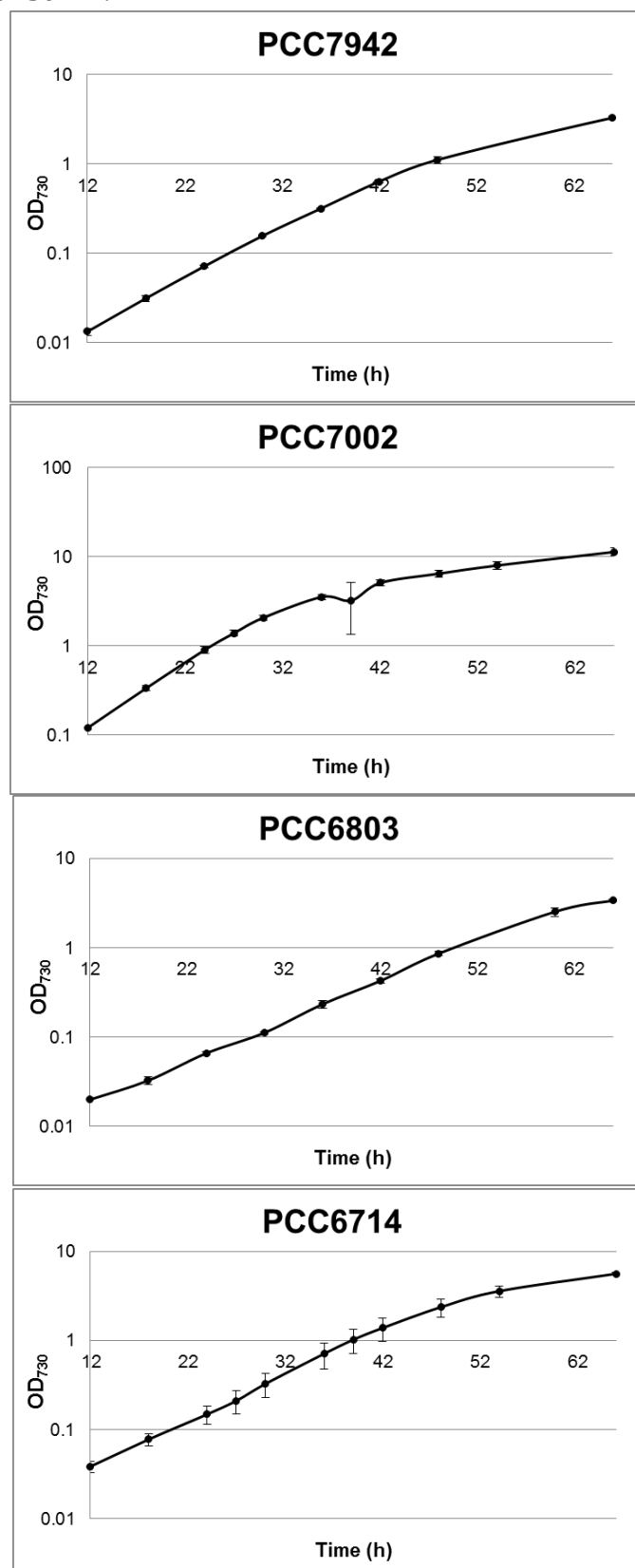


Table 2. The ratio of U-¹³C to (U-¹³C+U-¹²C) peak area in internal standard.

Metabolite	U- ¹³ C / (U- ¹³ C+U- ¹² C)	Metabolite	U- ¹³ C / (U- ¹³ C+U- ¹² C)
2-Isopropylmalate	0.990	Glutamine	0.996
2-Oxoglutarate	0.973	Glycerate	0.815
3PGA	0.999	Glycine	0.906
4-Aminobutanoate	0.086	Glycolate	0.447
6-Phosphogluconate	0.971	GMP	1.000
Acetyl CoA	1.000	GTP	1.000
ADP	0.997	Guanosine	0.980
ADP-Glc	1.000	Histidine	0.398
Alanine	0.958	HMBPP	1.000
α-Glycerophosphate	0.997	Homoserine	0.952
AMP	1.000	Hydroxyproline	0.995
Arginine + Ornithine	0.998	IMP	1.000
Asparagine	0.992	Inosine	1.000
Aspartate	0.993	IPP + DMAPP	1.000
ATP	1.000	Isocitrate	0.905
Citrate	0.910	Isoleucine	0.943
CMP	1.000	Leucine	0.953
CTP	1.000	Lysine	0.623
Cystein	1.000	Malate	0.786
Cytidine	0.632	MEP	0.980
DHAP	0.996	Methionine	0.937
Disaccharide-P	1.000	Mn6P	1.000
F1P	0.991	NAD	1.000
F6P	1.000	NADP	1.000
FAD	1.000	Nicotinate	1.000
FBP	1.000	Orotate	0.971
FMN	1.000	Pantothenate	1.000
Fumarate	0.885	PEP	0.999
G1P	0.954	Phenylalanine	0.877
G6P	0.993	Proline	0.946
GAP	0.999	Pyridoxamine-5P	1.000
GDP	0.990	Pyroglutamate	0.951
Glutamate	0.999	Pyruvate	0.954
R5P	0.998	R1P	0.973
Ru5P	1.000	Tryptophan	0.799
RuBP	1.000	Tyrosine	0.990
S7P	1.000	UDP-Glc	1.000
Serine	0.881	UMP	0.922
Shikimate	1.000	Uridine	1.000
Succinate	0.881	UTP	1.000
Threonine	0.924	Valine	0.966
TMP	0.996	XMP	1.000

Figure 4. $\log_3$ - $\log_3$ transformed linear calibration curve of each metabolite. Calibration curves were determined by least square linear regression analysis. The vertical axis represents naturally labeled standard amount in nmol per tube and the horizontal axis represents the area ratio of monoisotopic peak to uniformly ^{13}C -labeled peak.

