Table S1. The results of DE modeling for neurosporaxanthin absorption.

	Runs					
	1	2	3	4	5	6
Ω_{eg}	21712.84	21712.84	21712.84	21712.84	21712.84	21712.84
S_{100}	13.26	13.26	13.26	13.26	13.26	13.26
S_{200}	1.2e-09	1.1e-09	1.1e-09	4.8e-10	3.3e-10	2.3e-09
S_{300}	3.1e-10	8.5e-11	6.2e-10	1.4e-10	2.1e-10	5.8e-10
S_{400}	1.3e-10	4.1e-12	2.7e-11	6.5e-11	2.6e-10	3.4e-12
S_{500}	7.3e-11	1.4e-11	1.0e-10	8.9e-11	2.4e-11	1.6e-11
S_{600}	4.3e-12	6.4e-12	5.9e-12	3.9e-11	5.2e-11	6.1e-11
$S_{\nu 4}$	1.8e-11	2.1e-11	8.7e-11	1.1e-10	2.3e-10	2.4e-11
$S_{\nu 3}$	9.2e-11	8.5e-11	5.2e-11	1.3e-10	1.1e-10	1.1e-10
$S_{\nu 2}$	0.2671	0.2671	0.2671	0.2671	0.2671	0.2671
$S_{\nu 1}$	0.9296	0.9296	0.9296	0.9296	0.9296	0.9296
$S_{2\nu 2}$	2.6e-12	2.3e-12	1.6e-11	1.8e-11	5.7e-12	2.3e-12
$S_{\nu 1+\nu 2}$	1.3e-11	3.0e-12	4.9e-12	3.6e-11	1.7e-11	1.7e-11
$S_{2\nu 1}$	0.1278	0.1278	0.1278	0.1278	0.1278	0.1278
$f(x)$	0.000271	0.000271	0.000271	0.000271	0.000271	0.000271

Table S2. The results of DE modeling for neurosporaxanthin absorption.

	Runs					
	7	8	9	10	Mean	SD
Ω_{eg}	21712.84	21712.84	21712.84	21712.84	21712.84	0.000284
S_{100}	13.26	13.26	13.26	13.26	13.26	3.9e-06

S_{200}	2.9e-11	1.4e-09	4.5e-09	1.6e-09	1.4e-09	1.2e-09
S_{300}	1.4e-10	1.5e-09	1.1e-09	2.0e-10	4.9e-10	4.6e-10
S_{400}	6.8e-11	1.6e-11	1.5e-10	1.4e-10	8.7e-11	7.9e-11
S_{500}	5.6e-11	2.2e-11	4.4e-11	1.0e-10	5.4e-11	3.3e-11
S_{600}	9.8e-13	1.2e-10	1.3e-10	4.8e-11	4.7e-11	4.6e-11
$S_{\nu4}$	1.2e-11	2.9e-10	3.3e-10	1.6e-10	1.3e-10	1.1e-10
$S_{\nu3}$	4.3e-11	4.0e-10	5.4e-10	3.5e-11	1.6e-10	1.6e-10
$S_{\nu2}$	0.2671	0.2671	0.2671	0.2671	0.2671	1.1e-06
$S_{\nu1}$	0.9296	0.9296	0.9296	0.9296	0.9296	9.6e-07
$S_{2\nu2}$	8.0e-13	2.6e-12	2.8e-11	7.7e-12	8.6e-12	8.6e-12
$S_{\nu1+\nu2}$	3.7e-12	3.6e-11	5.9e-11	2.1e-11	2.1e-11	1.7e-11
$S_{2\nu1}$	0.1278	0.1278	0.1278	0.1278	0.1278	2.2e-07
$f(x)$	0.000271	0.000271	0.000271	0.000271		

Table S3. The results of DE modeling for neurosporene absorption.

	Runs					
	1	2	3	4	5	6
Ω_{eg}	23342.76	23342.77	23342.77	23342.76	23342.78	23342.75
S_{100}	4.74	4.74	4.74	4.74	4.74	4.74
S_{200}	3.7e-08	4.9e-08	5.5e-08	8.4e-09	1.2e-06	1.4e-07
S_{300}	3.0e-08	1.2e-08	4.7e-09	1.0e-09	2.3e-08	1.4e-07
S_{400}	9.7e-09	2.4e-09	3.7e-08	6.8e-10	1.1e-07	8.0e-08
S_{500}	9.5e-09	1.5e-09	3.5e-09	4.4e-11	4.9e-08	1.6e-08
S_{600}	1.4e-08	2.0e-09	7.1e-09	5.6e-11	8.6e-08	4.6e-08

S_{v4}	2.8e-07	2.7e-08	2.2e-07	5.7e-09	5.2e-07	3.3e-07
S_{v3}	0.4472	0.4472	0.4472	0.4472	0.4472	0.4472
S_{v2}	5.6e-08	6.8e-08	5.8e-07	7.3e-10	1.7e-06	5.9e-07
S_{v1}	0.7943	0.7943	0.7943	0.7943	0.7943	0.7943
S_{2v2}	0.0895	0.0895	0.0895	0.0895	0.0895	0.0895
S_{v1+v2}	3.9e-10	1.3e-09	5.4e-10	1.5e-10	1.9e-08	2.8e-08
S_{2v1}	0.1011	0.1011	0.1011	0.1011	0.1011	0.1011
$f(x)$	0.000230	0.000230	0.000230	0.000230	0.000230	0.000230

Table S4. The results of DE modeling for neurosporene absorption.

	Runs					
	7	8	9	10	Mean	SD
Ω_{eg}	23342.76	23342.77	23342.76	23342.76	23342.76	0.007801
S_{100}	4.74	4.74	4.74	4.74	4.74	5.6e-05
S_{200}	5.7e-09	3.8e-06	1.8e-08	3.9e-08	5.4e-07	1.1e-06
S_{300}	4.6e-08	2.1e-07	1.1e-10	7.7e-09	4.8e-08	6.7e-08
S_{400}	2.9e-08	1.8e-07	2.3e-09	7.6e-09	4.6e-08	5.7e-08
S_{500}	3.3e-09	7.2e-07	2.2e-10	2.7e-09	8.1e-08	2.2e-07
S_{600}	5.6e-08	1.0e-07	5.2e-11	3.2e-09	3.2e-08	3.7e-08
S_{v4}	2.0e-07	2.8e-06	2.5e-09	4.4e-09	4.4e-07	8.0e-07
S_{v3}	0.4472	0.4472	0.4472	0.4472	0.4472	6.0e-06
S_{v2}	2.7e-07	4.0e-06	3.0e-08	1.4e-09	7.2e-07	1.2e-06
S_{v1}	0.7943	0.7943	0.7943	0.7943	0.7943	6.9e-06
S_{2v2}	0.0895	0.0895	0.0895	0.0895	0.0895	3.0e-06

S_{v1+v2}	2.8e-08	9.0e-08	8.0e-11	3.5e-10	1.7e-08	2.7e-08
S_{2v1}	0.1011	0.1011	0.1011	0.1011	0.1011	5.3e-06
$f(x)$	0.000230	0.000230	0.000230	0.000230		

Table S5. The results of DE modeling for torulene absorption.

	Runs					
	1	2	3	4	5	6
Ω_{eg}	21221.11	21221.11	21221.10	21221.11	21221.11	21221.11
S_{100}	7.38	7.38	7.38	7.38	7.38	7.38
S_{200}	2.1e-10	6.3e-10	1.1e-08	1.2e-08	2.7e-09	6.1e-10
S_{300}	2.3e-10	1.8e-10	1.4e-09	1.2e-08	1.4e-10	8.6e-11
S_{400}	4.2e-11	9.7e-14	3.2e-10	1.7e-10	3.9e-09	2.4e-11
S_{500}	3.7e-11	1.2e-10	2.0e-11	7.7e-10	1.6e-09	1.1e-10
S_{600}	2.2e-11	1.9e-10	3.4e-10	7.1e-10	2.7e-10	1.2e-11
S_{v4}	4.2e-11	3.4e-11	1.3e-09	5.0e-10	1.1e-09	1.2e-11
S_{v3}	6.5e-11	2.5e-11	6.0e-10	7.2e-10	4.7e-09	2.0e-11
S_{v2}	0.6548	0.6548	0.6548	0.6548	0.6548	0.6548
S_{v1}	0.5941	0.5941	0.5941	0.5941	0.5941	0.5941
S_{2v2}	0.0636	0.0636	0.0636	0.0636	0.0636	0.0636
S_{v1+v2}	0.0492	0.0492	0.0492	0.0492	0.0492	0.0492
S_{2v1}	0.0589	0.0589	0.0588	0.0589	0.0589	0.0589
$f(x)$	0.000170	0.000170	0.000170	0.000170	0.000170	0.000170

Table S6. The results of DE modeling for torulene absorption.

	Runs					
	7	8	9	10	Mean	SD
Ω_{eg}	21221.11	21221.11	21221.11	21221.11	21221.11	0.005136
S_{100}	7.38	7.38	7.38	7.38	7.38	1.7e-05
S_{200}	7.8e-10	5.9e-09	1.4e-09	9.9e-09	4.5e-09	4.5e-09
S_{300}	2.6e-10	7.2e-09	2.8e-10	3.4e-09	2.5e-09	3.8e-09
S_{400}	3.9e-11	1.5e-09	1.4e-10	1.9e-09	8.0e-10	1.2e-09
S_{500}	2.4e-10	4.9e-10	3.2e-11	6.9e-10	4.2e-10	4.9e-10
S_{600}	6.7e-11	1.0e-11	2.8e-12	1.6e-10	1.8e-10	2.1e-10
$S_{\nu4}$	6.3e-11	3.5e-09	1.1e-11	1.9e-10	6.8e-10	1.0e-09
$S_{\nu3}$	2.0e-10	7.7e-11	4.7e-11	1.5e-09	8.0e-10	1.4e-09
$S_{\nu2}$	0.6548	0.6548	0.6548	0.6548	0.6548	5.7e-06
$S_{\nu1}$	0.5941	0.5941	0.5941	0.5941	0.5941	6.6e-06
$S_{2\nu2}$	0.0636	0.0636	0.0636	0.0636	0.0636	7.3e-06
$S_{\nu1+\nu2}$	0.0492	0.0492	0.0492	0.0492	0.0492	1.5e-05
$S_{2\nu1}$	0.0589	0.0589	0.0589	0.0589	0.0589	1.3e-05
$f(x)$	0.000170	0.000170	0.000170	0.000170		

Table S7. The results of DE modeling for γ-carotene absorption.

	Runs					
	1	2	3	4	5	6
Ω_{eg}	22181.32	22181.32	22181.32	22181.32	22181.32	22181.32
S_{100}	8.28	8.28	8.28	8.28	8.28	8.28
S_{200}	3.9e-11	1.4e-09	1.8e-10	1.8e-10	2.9e-10	4.9e-11

S_{300}	6.9e-11	4.0e-11	8.1e-11	2.0e-10	1.3e-10	3.1e-11
S_{400}	5.4e-11	3.1e-11	1.7e-11	3.5e-11	2.3e-11	5.0e-11
S_{500}	2.5e-11	5.3e-11	3.4e-11	2.4e-11	2.4e-11	1.3e-11
S_{600}	1.4e-11	2.8e-11	1.4e-11	5.8e-11	1.8e-11	5.2e-12
$S_{\nu4}$	2.6e-11	2.7e-11	1.9e-11	2.5e-11	2.1e-11	8.3e-12
$S_{\nu3}$	1.9e-11	5.6e-11	2.0e-12	9.4e-11	9.5e-12	2.5e-11
$S_{\nu2}$	0.4563	0.4563	0.4563	0.4563	0.4563	0.4563
$S_{\nu1}$	0.7534	0.7534	0.7534	0.7534	0.7534	0.7534
$S_{2\nu2}$	0.0222	0.0222	0.0222	0.0222	0.0222	0.0222
$S_{\nu1+\nu2}$	0.0731	0.0731	0.0731	0.0731	0.0731	0.0731
$S_{2\nu1}$	0.0478	0.0478	0.0478	0.0478	0.0478	0.0478
$f(x)$	0.000122	0.000122	0.000122	0.000122	0.000122	0.000122

Table S8. The results of DE modeling for γ-carotene absorption.

	Runs					
	7	8	9	10	Mean	SD
Ω_{eg}	22181.32	22181.32	22181.32	22181.32	22181.32	0.000933
S_{100}	8.28	8.28	8.28	8.28	8.28	1.9e-06
S_{200}	2.8e-08	2.3e-11	1.5e-11	3.0e-11	3.0e-09	8.3e-09
S_{300}	1.9e-09	2.5e-11	7.3e-11	1.2e-11	2.5e-10	5.4e-10
S_{400}	1.0e-09	1.1e-11	3.3e-12	3.7e-12	1.3e-10	3.0e-10
S_{500}	4.7e-10	1.4e-12	9.5e-12	7.5e-12	6.6e-11	1.3e-10
S_{600}	2.5e-10	5.0e-12	1.1e-11	6.0e-12	4.1e-11	7.1e-11
$S_{\nu4}$	1.7e-09	5.2e-12	3.0e-11	4.4e-13	1.9e-10	5.1e-10

S_{v3}	1.1e-09	9.1e-12	1.4e-11	3.3e-12	1.3e-10	3.1e-10
S_{v2}	0.4563	0.4563	0.4563	0.4563	0.4563	5.8e-07
S_{v1}	0.7534	0.7534	0.7534	0.7534	0.7534	6.1e-07
S_{2v2}	0.0222	0.0222	0.0222	0.0222	0.0222	3.3e-07
S_{v1+v2}	0.0731	0.0731	0.0731	0.0731	0.0731	5.8e-07
S_{2v1}	0.0478	0.0478	0.0478	0.0478	0.0478	5.4e-07
$f(x)$	0.000122	0.000122	0.000122	0.000122		

Table S9. The results of DE modeling for ζ-carotene absorption.

	Runs					
	1	2	3	4	5	6
Ω_{eg}	25917.79	25917.79	25917.80	25917.79	25917.79	25917.79
S_{100}	6.04	6.04	6.04	6.04	6.04	6.04
S_{200}	1.5e-08	5.7e-10	1.2e-07	1.1e-07	5.6e-09	1.3e-07
S_{300}	8.2e-10	8.7e-10	3.6e-08	6.3e-10	1.7e-09	6.1e-08
S_{400}	2.3e-09	4.2e-10	2.0e-08	4.3e-09	9.9e-10	2.9e-08
S_{500}	2.1e-09	5.0e-10	3.6e-11	4.8e-10	1.2e-09	6.5e-09
S_{600}	1.8e-09	1.4e-11	3.2e-09	4.7e-09	1.5e-10	5.3e-09
S_{v4}	1.2e-09	2.6e-10	1.9e-09	1.4e-08	7.3e-09	3.2e-08
S_{v3}	3.7e-09	3.0e-09	3.4e-08	3.4e-09	1.1e-08	7.4e-08
S_{v2}	0.2837	0.2837	0.2837	0.2837	0.2837	0.2837
S_{v1}	0.8242	0.8242	0.8242	0.8242	0.8242	0.8242
S_{2v2}	0.1438	0.1438	0.1438	0.1438	0.1438	0.1438
S_{v1+v2}	4.8e-10	7.5e-11	1.5e-09	2.9e-10	5.9e-11	6.5e-09

$S_{2\nu1}$	0.1255	0.1255	0.1255	0.1255	0.1255	0.1255
$f(x)$	0.000344	0.000344	0.000344	0.000344	0.000344	0.000344

Table S10. The results of DE modeling for ζ-carotene absorption.

	Runs					
	7	8	9	10	Mean	SD
Ω_{eg}	25917.78	25917.79	25917.80	25917.78	25917.79	0.004404
S_{100}	6.04	6.04	6.04	6.04	6.04	8.0e-05
S_{200}	8.5e-07	5.7e-09	2.9e-06	5.5e-09	4.2e-07	8.8e-07
S_{300}	2.4e-08	2.1e-08	7.9e-07	1.3e-09	9.4e-08	2.3e-07
S_{400}	1.7e-08	2.4e-09	7.1e-07	9.3e-10	7.9e-08	2.1e-07
S_{500}	8.4e-08	1.0e-09	2.6e-07	7.3e-10	3.5e-08	7.8e-08
S_{600}	2.1e-08	8.1e-10	1.3e-07	2.7e-10	1.6e-08	3.7e-08
$S_{\nu4}$	2.0e-08	1.7e-09	3.0e-08	2.2e-09	1.1e-08	1.2e-08
$S_{\nu3}$	1.8e-08	7.4e-09	1.0e-06	5.5e-10	1.2e-07	2.9e-07
$S_{\nu2}$	0.2837	0.2837	0.2837	0.2837	0.2837	9.0e-06
$S_{\nu1}$	0.8242	0.8242	0.8241	0.8242	0.8242	8.4e-06
$S_{2\nu2}$	0.1438	0.1438	0.1438	0.1438	0.1438	2.4e-06
$S_{\nu1+\nu2}$	5.1e-10	8.8e-10	8.0e-08	1.1e-10	9.0e-09	2.4e-08
$S_{2\nu1}$	0.1254	0.1255	0.1255	0.1255	0.1255	2.5e-06
$f(x)$	0.000344	0.000344	0.000344	0.000344		