

Table S1. Reaction inputs (oil, reaction type and conditions) to determine effective rate constants.

Raw material	Reaction	Reaction conditions	Ref.
Coconut oil	Esterification	Catalyst: H ₂ SO ₄ ; catalyst concentration: 0.5 (% w/w); methanol-to-oil molar ratio: 8:1	[12]
Sunflower oil	Esterification	Catalyst: H ₂ SO ₄ ; catalyst concentration: 0.2 (% w/w); methanol-to-oil molar ratio: 15:1	[12]
Sunflower oil	Esterification	Catalyst: H ₂ SO ₄ ; catalyst concentration: various; ethanol-to-oil molar ratio: 15:1	[12]
Sunflower oil	Esterification	Catalyst: H ₂ SO ₄ ; catalyst concentration: various; methanol-to-oil molar ratio: 10:1	[13]
Rapeseed oil	Transesterification	Catalyst KOH; catalyst concentration: 1 (% w/w); methanol-to-oil molar ratio: 6:1	[14]
Sunflower oil	Transesterification	Catalyst NaOH; catalyst concentration: various; methanol-to-oil molar ratio: various	[15]
Palm oil	Transesterification	Catalyst NaOH; catalyst concentration: 0.2 (% w/w); methanol-to-oil molar ratio: 6:1	[19]
Pongamia oil	Transesterification	Catalyst KOH; catalyst concentration: 1 (% w/w); methanol-to-oil molar ratio: 10:1	[17]
Ethiopian rape oil	Transesterification	Catalyst KOH; catalyst concentration: various, methanol-to-oil molar ratio: 6:1	[18]
Sunflower oil	Transesterification	Catalyst KOH; catalyst concentration: various, methanol-to-oil molar ratio: 6:1	[16]
Soybean oil	Transesterification	Catalyst NaOH; catalyst concentration: 0.2 (% w/w); methanol-to-oil molar ratio: 6:1	[20]

Table S2. Effective rate constants resulting from esterification (SFO: sunflower oil; CO: coconut oil; PoO: pongamia oil; ERO: Ethiopian rape oil; PO: palm oil; SO: soybean oil; RO: rapeseed oil; Me: methanol; Et: ethanol; n.d.: no data).

Parameters/oil	CO [12]	SFO [12]	SFO [12]	SFO [12]	SFO [12]	SFO [12]	SFO [12]	SFO [13]	SFO [13]
Temperature, T (°C)	60	60	60	60	70	70	70	60	60
Catalyst	H ₂ SO ₄	H ₂ SO ₄	H ₂ SO ₄	H ₂ SO ₄	H ₂ SO ₄	H ₂ SO ₄	H ₂ SO ₄	H ₂ SO ₄	H ₂ SO ₄
Catalyst concentration (% w/w)	0.5	0.2	0.2	1	0.2	0.5	1	5	10
Alcohol-to-oil molar ratio	8:1(Me:oil)	15:1(Me:oil)	15:1(Et:oil)	15:1(Et:oil)	15:1(Et:oil)	15:1(Et:oil)	15:1(Et:oil)	10:1(Me:oil)	10:1(Me:oil)
Stirring speed (rpm)	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	600	600
k_1 (l mol ⁻¹ s ⁻¹)	0.00031667	0.00021667	0.00003333	0.0004000	0.00016667	0.00028333	0.00048333	0.031460	0.04009158
k_2 (l mol ⁻¹ s ⁻¹)	0.00020000	0.00020000	0.00008333	0.00098333	0.00041667	0.00058333	0.00076667	0.000507	0.00013867
Parameters/oil	RO [14]	RO [14]	RO [14]	SFO [15]	SFO [15]	SFO [15]	SFO [15]	SFO [15]	SFO [15]
Temperature, T (°C)	45	55	65	60	60	25	40	60	60
Catalyst	KOH	KOH	KOH	NaOH	NaOH	NaOH	NaOH	NaOH	NaOH
Catalyst concentration (% w/w)	1	1	1	0.5	0.5	0.5	0.5	0.25	1.0
Methanol-to-oil molar ratio	6:1	6:1	6:1	6:1	6:1	6:1	6:1	6:1	10:1
Stirring speed (rpm)	n.d.	n.d.	n.d.	400	600	400	400	400	400
k_3 (l mol ⁻¹ s ⁻¹)	0.00128667	0.00188167	0.00416167	0.00149167	0.00219333	0.00012333	0.00036333	0.00082500	0.00385667
k_4 (l mol ⁻¹ s ⁻¹)	0.00308333	0.00154667	0.00097667	0.00015667	0.00032750	0.00002333	0.00004833	0.00224500	0.00027667
k_5 (l mol ⁻¹ s ⁻¹)	0.00118383	0.00173000	0.00318667	0.00580000	0.00537833	0.00033833	0.00108500	0.00167000	0.00748000

k_6 (l mol ⁻¹ s ⁻¹)	0.00183000	0.00129667	0.00124000	0.00214167	0.00411667	0.00018167	0.00053167	0.00684833	0.00178000	0.00133000
k_7 (l mol ⁻¹ s ⁻¹)	0.00178858	0.00202667	0.00366167	0.00814000	0.01435167	0.00229000	0.00380000	0.00171333	0.01461667	0.00578667
k_8 (l mol ⁻¹ s ⁻¹)	0.00015700	0.00010833	0.00002850	0.00064167	0.00101833	0.00009833	0.00022167	0.00100667	0.00106167	0.00090333
Parameters/oil	SFO [15]	SFO [15]	SFO [16]	SFO [16]	SFO [16]	SFO [16]	SFO [16]	SFO [16]	SFO [16]	SFO [16]
Temperature, T (°C)	60	60	25	25	25	35	35	35	45	45
Catalyst	NaOH	NaOH	KOH	KOH	KOH	KOH	KOH	KOH	KOH	KOH
Catalyst concentration (% w/w)	0.5	0.5	0.5	1.0	1.5	0.5	1.0	1.5	0.5	1.0
Methanol-to-oil molar ratio	15:1	20:1	6:1	6:1	6:1	6:1	6:1	6:1	6:1	6:1
Stirring speed (rpm)	400	400	600	600	600	600	600	600	600	600
k_3 (l mol ⁻¹ s ⁻¹)	0.00057167	0.00049833	0.01458333	0.02096436	0.02591036	0.16666667	0.15723270	0.00770308	0.06250000	0.05241090
k_4 (l mol ⁻¹ s ⁻¹)	0.00005333	0.00006500	0.05208333	0.10272537	0.12955182	1.23958333	1.43605870	0.02941176	0.30208333	0.31970650
k_5 (l mol ⁻¹ s ⁻¹)	0.00143167	0.00142667	0.03125000	0.17505241	0.26260504	2.18750000	2.41090147	0.02380952	0.51250000	0.72851153
k_6 (l mol ⁻¹ s ⁻¹)	0.00005167	0.00006667	0.02916667	0.22851153	0.30462185	3.31250000	4.33962264	0.01470588	0.63541667	1.04821803
k_7 (l mol ⁻¹ s ⁻¹)	0.00278000	0.00251833	0.04583333	0.02830189	0.02240896	0.07083333	0.04192872	0.01820728	0.07708333	0.04716981
k_8 (l mol ⁻¹ s ⁻¹)	0.00065833	0.00070167	0.00333333	0.01153040	0.00053922	0.00072917	0.00027254	0.00091036	0.00160417	0.00031447
Parameters/oil	SFO [16]	SFO [16]	SFO [16]	SFO [16]	SFO [16]	SFO [16]	SFO [19]	PoO [17]	ERO [18]	ERO [18]
Temperature, T (°C)	45	55	55	55	65	65	65	60	25	25
Catalyst	KOH	KOH	KOH	KOH	KOH	KOH	KOH	KOH	KOH	KOH
Catalyst concentration (% w/w)	1.5	0.5	1.0	1.5	0.5	1.0	1.5	1.0	0.5	1.0
Methanol-to-oil molar ratio	6:1	6:1	6:1	6:1	6:1	6:1	6:1	10:1	6:1	6:1
Stirring speed (rpm)	600	600	600	600	600	600	600	n.d.	600	600
k_3 (l mol ⁻¹ s ⁻¹)	0.10854342	0.63750000	0.01572327	0.02801120	0.15416667	0.21488470	0.28011204	0.00047667	0.01000000	0.01132075
k_4 (l mol ⁻¹ s ⁻¹)	0.59523810	4.97916667	0.06918239	0.14005602	1.03541667	1.14255765	1.54061625	0.00024000	0.05250000	0.05157233
k_5 (l mol ⁻¹ s ⁻¹)	1.43557423	6.77083333	0.04402516	0.30112045	2.47916667	3.15513627	3.85154062	0.00009667	0.04125000	0.03647799
k_6 (l mol ⁻¹ s ⁻¹)	1.57563025	11.97916667	0.03668763	0.32913165	2.62500000	3.09224319	4.58683473	0.00355000	0.01875000	0.03144654
k_7 (l mol ⁻¹ s ⁻¹)	0.04271709	0.11250000	0.05136268	0.04201681	0.15416667	0.08700210	0.06372549	0.00018500	0.04125000	0.03459119
k_8 (l mol ⁻¹ s ⁻¹)	0.00008403	0.00018750	0.00041929	0.00003501	0.00012500	0.00001048	0.00000700	0.00000852	0.00228750	0.00105031
Parameters/oil	ERO [18]	ERO [18]	ERO [18]	ERO [18]	ERO [18]	ERO [18]	ERO [18]	ERO [18]	ERO [18]	ERO [18]
Temperature, T (°C)	25	35	35	35	45	45	45	55	55	55
Catalyst	KOH	KOH	KOH	KOH	KOH	KOH	KOH	KOH	KOH	KOH
Catalyst concentration (% w/w)	1.5	0.5	1.0	1.5	0.5	1.0	1.5	0.5	1.0	1.5
Methanol-to-oil molar ratio	6:1	6:1	6:1	6:1	6:1	6:1	6:1	6:1	6:1	6:1
Stirring speed (rpm)	600	600	600	600	600	600	600	600	600	600
k_3 (l mol ⁻¹ s ⁻¹)	0.01386555	0.04625000	0.02955975	0.02815126	0.08375000	0.05786164	0.05588235	0.15625000	0.16666667	0.20294118
k_4 (l mol ⁻¹ s ⁻¹)	0.04201681	0.22875000	0.14654088	0.17857143	0.41500000	0.31320755	0.34957983	1.41000000	1.01257862	0.78445378
k_5 (l mol ⁻¹ s ⁻¹)	0.03865546	0.32500000	0.25597484	0.32647059	0.83125000	0.72327044	0.70714286	2.10375000	2.25345912	2.06596639

k_6 (l mol ⁻¹ s ⁻¹)	0.05546218	4.78750000	0.33018868	0.34327731	0.91625000	1.05849057	0.91050420	3.54125000	2.50503145	2.02394958
k_7 (l mol ⁻¹ s ⁻¹)	0.03277311	0.05250000	0.03899371	0.04201681	0.05625000	0.04402516	0.04705882	0.81250000	0.06289308	0.05588235
k_8 (l mol ⁻¹ s ⁻¹)	0.00034874	0.00208750	0.00045912	0.00002941	0.00140000	0.00031447	0.00002101	0.00010000	0.00011321	0.00001261
Parameters/oil	ERO [18]	ERO [18]	ERO [18]	PO [19]	SO [20]					
Temperature, T (°C)	65	65	65	50	50					
Catalyst	KOH	KOH	KOH	NaOH	NaOH					
Catalyst concentration (% w/w)	0.5	1.0	1.5	0.2	0.2					
Methanol-to-oil molar ratio	6:1	6:1	6:1	6:1	6:1					
Stirring speed (rpm)	600	600	600	400	300					
k_3 (l mol ⁻¹ s ⁻¹)	0.27125000	0.32515723	0.28907563	0.00081667	0.00083333					
k_4 (l mol ⁻¹ s ⁻¹)	3.02125000	2.56792453	1.97478992	0.00186667	0.00183333					
k_5 (l mol ⁻¹ s ⁻¹)	4.58375000	3.42767296	3.88655462	0.00376667	0.00358333					
k_6 (l mol ⁻¹ s ⁻¹)	8.83375000	6.23710692	4.47478992	0.00221667	0.02046667					
k_7 (l mol ⁻¹ s ⁻¹)	0.85000000	0.05220126	0.06428571	0.00203333	0.00403333					
k_8 (l mol ⁻¹ s ⁻¹)	0.00053750	0.00006289	0.00000840	0.00026667	0.00011667					