Supplementary Materials

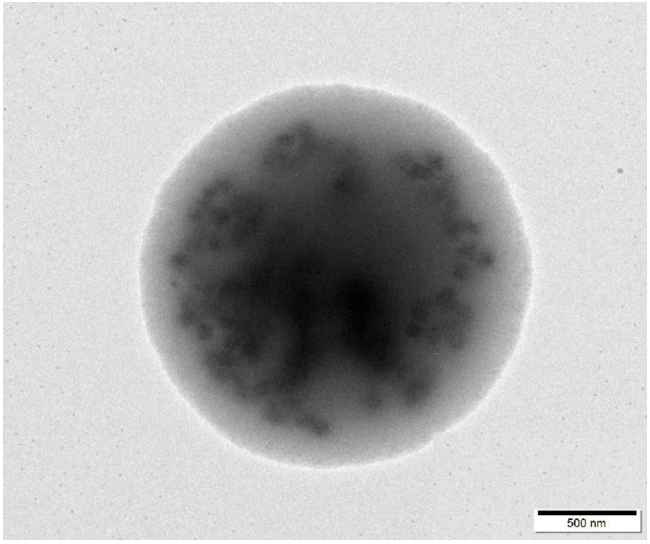

Fig. S1. The TEM image of the prepared catalyst.

Table S1. Test Factor Level Coding Table

Factors	-1	0	1
A (reaciton time/h)	5	6	7
B (MeOH/OA molar ratio)	5	6	7
C (catalyst amount/%)	6	7	8

Table S2. Response Surface Test Design and Results

Run	A	B	C	Conversion %
1	7	6	8	96.46
2	6	6	7	92.65
3	6	6	7	92.08
4	6	5	6	82.99
5	6	7	6	85.51
6	7	7	7	90.61
7	6	6	7	92.35
8	7	6	6	88.65
9	6	6	7	97.76
10	7	5	7	81.52
11	6	5	8	88.51
12	5	5	7	84.47
13	5	7	7	80.99
14	5	6	6	85.39
15	5	6	8	97.15
16	6	6	7	97.68
17	6	7	8	85.61

Table S3. Variance Analysis

	Sum of squares	df	Mean square	F-value	p-value	
Model	455.84	9	50.65	5.41	0.0184	significant
A	10.67	1	10.67	1.14	0.3212	
B	3.42	1	3.42	0.3651	0.5647	
C	79.32	1	79.32	8.47	0.0227	
AB	39.5	1	39.5	4.22	0.0791	
AC	3.9	1	3.9	0.4165	0.5392	
BC	7.34	1	7.34	0.7842	0.4052	
A^2	15.59	1	15.59	1.67	0.2379	
B^2	281.87	1	281.87	30.1	0.0009	
C^2	1.87	1	1.87	0.2	0.6682	
Residual	65.55	7	9.36			
Lack of Fit	30.91	3	10.3	1.19	0.4195	not significant
Pure Error	34.64	4	8.66			
Cor Total	521.39	16				

Table S4. Properties of Biodiesel Production from Different Feedstocks

	Feedstocks	Kinetic viscosity	Pour point	Acid value	Density	Flash point	Ref.
Unit	-	mm^2/s; 40°C	°C	KOH mg/kg	kg/m^3; 15°C	°C	-
B100	Chicken fat	5.5	3	0.35	889	183	[32]
WCO	Waste cooking oil	4.0	7	0.31	886	138	[33]
This study	OA	17.6	-3	0.67	862	180	-

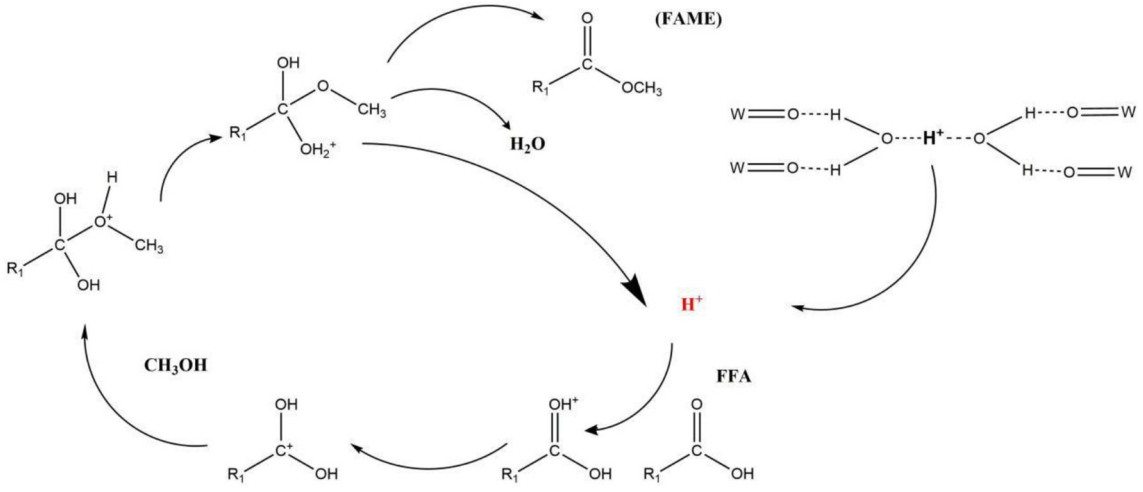

Fig. S2. Schematic diagram of esterification mechanism.