Electronic Supplementary Material (ESI) for Green Chemistry.

Supporting Information

High-Grade Diesel Production from Hydrodeoxygenation of Palm Oil over Hierarchically Structured Ni/HBEA Catalyst

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Table S1. Physicochemical properties of the used HBEA.

Zeolite	S_{BET} [m^2g^{-1}] [a]		V_{pore} [cm^3g^{-1}] [a]		Si/Al_2 [$molmol^{-1}$] [b]
	Micro	Meso	Micro	Meso	
HBeta	445	200	0.18	0.58	22

[a] The specific surface areas and pore volumes are determined by N_2 sorption at 77 K.

[b.] The Si and Al contents are determined by ICP.

Table S2. The properties and activities of diverse Ni/HBeta for catalyzing stearic acid HDO.

Catalyst	Rate		Iso_{HC}/ $Total_{HC}$[%]
	[$mmol \cdot g^{-1} \cdot h^{-1}$]	[$g \cdot g^{-1} \cdot h^{-1}$]	
Ni/HBeta (untreated)	45	13	14
Ni/HBeta (with TPAOH/NaOH)	67	19	15
Ni/HBeta (with Na_2CO_3)	58	17	14
Ni/HBeta (with steaming)	9	3	0
Ni/HBeta (with steaming-TPAOH/NaOH)	42	12	8
Ni/HBeta (with CTAB/NaOH)	31	9	9
Ni/HBeta (DP) [a]	18	5	2

[a] Conditions: 1.0 g stearic acid, 0.2 g catalyst ,100 mL dodecane, 260 ℃, 40 bar H_2, 2 h, stirring at 700 rpm, please see ref. [1]

Table S3. Fatty acid composition of the used palm oil.

$C_{13:0}$ [a]	$C_{14:0}$	$C_{15:0}$	$C_{16:1}$	$C_{16:0}$	$C_{17:1}$	$C_{17:0}$	$C_{18:1}$	$C_{18:2}$	$C_{18:0}$	$C_{20:1}$	$C_{20:0}$	$C_{22:0}$	$C_{24:0}$
0.17	0.88	0.03	0.21	35.96	0.02	0.06	28.76	21.14	12.23	0.14	0.29	0.04	0.05

[a] The nomenclature shows the number of carbon atoms and the number of C=C double bonds:
for example the alkyl chain of the present fatty acid contains 14 C atoms and no double bonds

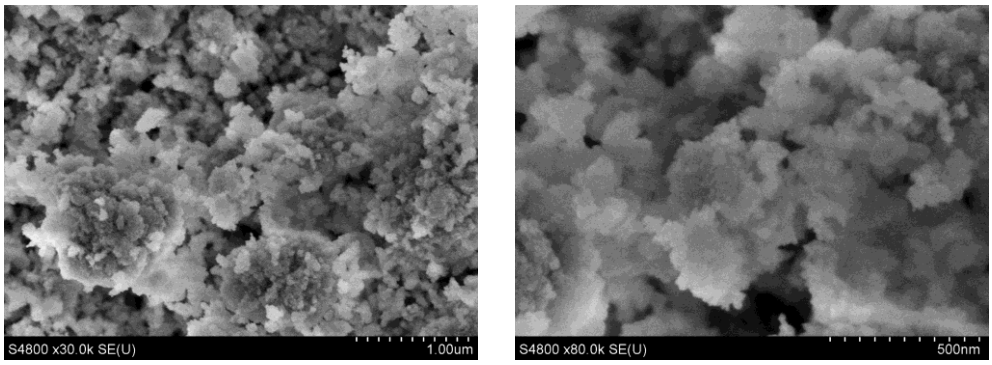


Figure S1. SEM images of the used parent HBEA.

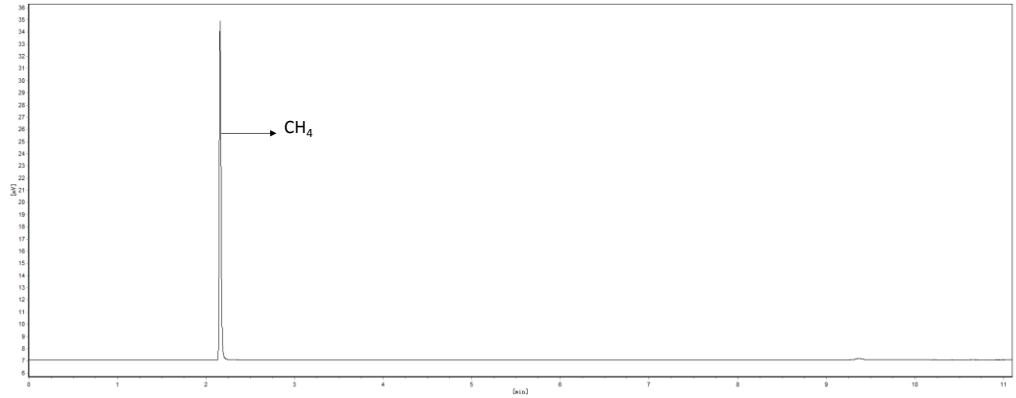


Figure S2. GC spectra of gaseous products from stearic acid hydrodeoxygenation. Reaction condition: 5.0 g stearic acid, 0.2 g Ni/HBeta, 80 mL dodecane, 260 ℃, 4 MPa H_2, stirring at 600 rpm.

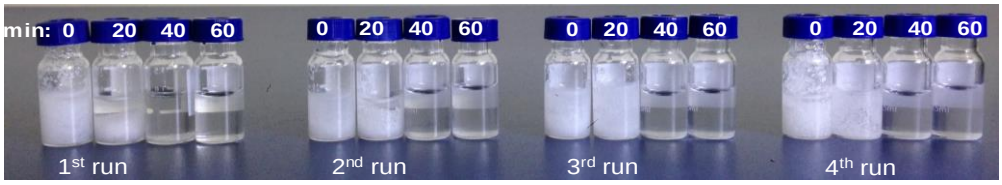
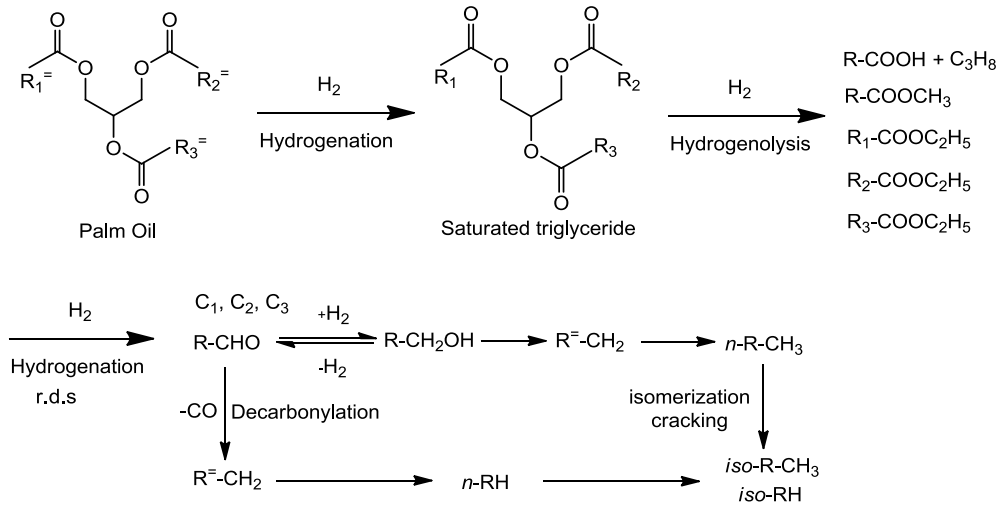


Figure S3. Images of four catalyst recycling runs during palm oil upgrading.



$R_1^=$, $R_2^=$, $R_3^=$: unsaturated alkyl chain (mainly C_{16}, C_{18})

Methanation: $CO + H_2 = CH_4 + H_2O$

Scheme S1. Proposed reaction pathways for one-step transformation of palm oil to alkanes over Ni/HBeta.

Reference:

1. W. Song, C. Zhao, J. A. Lercher, *Chem. Eur. J.* **2013**, *19*, 9833.