

Electronic Supplementary Material

Polyethylene hydrogenolysis over bimetallic catalyst with suppression of methane formation

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Table S1. BET surface area and pore volume of Ru/SiO₂ and 1Ni5Ru/SiO₂ catalyst.

catalyst	Surface area /(m ² /g _{cat})	Pore volume /(cm ³ /g _{cat})	Average pore diameter /nm
Ru/SiO ₂	345.54	2.32	16.32
1Ni5Ru/SiO ₂	299.70	0.95	8.33

Table S2. LDPE hydrogenolysis results over Ru/SiO₂ catalyst under different reaction conditions.

	Temp /°C	H ₂ Pressure /MPa	Time /h	Methane Yield /%	Ethane Yield /%	Propane Yield /%	Liquid yield /%	Solid residue /%
1	220	3	4	1.23	0.09	0	1.99	96.4
2	250	3	4	25.9	3.65	3.56	65.5	1.30
3	280	3	4	49.7	4.38	4.19	39.7	2.49
4	250	1	4	10.9	0.92	0.35	19.9	68.4
5	250	2	4	7.03	1.23	0.32	26.7	63.9
6	250	4	4	17.9	5.45	3.52	72.3	2.14
7	250	3	2	9.27	0.95	0.37	14.1	76.6
8	250	3	3	19.1	2.65	1.76	62.4	14.8

Table S3. LDPE hydrogenolysis results over Ni-modified Ru/SiO₂ catalyst with different Ni loadings. Reactions were performed at 250 °C and 3 MPa H₂ for 4h with 1.5 g LDPE and 50 mg catalyst.

	Catalyst	Methane Yield /%	Ethane Yield /%	Propane Yield /%	Liquid yield /%	Solid residue /%
1	5Ru/SiO ₂	25.92	3.65	3.56	65.5	1.3
2	0.5Ni5Ru/SiO ₂	49.14	4.48	1.89	42.84	2.91
3	1Ni5Ru/SiO ₂	9.36	0.66	0.35	83.05	4.5
4	2Ni5Ru/SiO ₂	1.9	0.21	0.23	15.67	82.57
5	3Ni5Ru/SiO ₂	0.53	0.04	0	0.76	96.53

Table S4. Carbon number distribution over Ni-modified Ru/SiO₂ catalyst with different Ni loadings. Reactions were performed at 250 °C and 3 MPa H₂ for 4h with 1.5 g LDPE and 50 mg catalyst.

Carbon Number	5Ru/SiO ₂ /%	0.5Ni5Ru/SiO ₂ /%	1Ni5Ru/SiO ₂ /%	2Ni5Ru/SiO ₂ /%
1	26.58876	49.9645	10.01919	10.54576
2	3.74417	4.55517	0.70648	1.16558
3	3.65185	1.92171	0.37465	1.27659
4	0.00834	0.03593	0.00925	0.01338
5	0.12652	0.36265	0.11917	0.01562
6	0.15455	0.43247	0.11275	0.00943
7	0.53478	1.28792	0.35752	0.1114
8	0.64352	1.49602	0.42103	0.07989
9	0.87672	1.5794	0.55448	0.14288
10	1.2549	1.44179	0.84849	0.23169
11	1.45664	2.50128	1.1896	0.42183
12	1.72882	1.17811	1.71982	0.72525
13	2.34293	1.17472	2.31141	1.05088
14	2.75804	1.21675	2.80309	1.65402
15	3.34274	1.54821	3.31261	2.14616
16	4.05533	1.93662	4.06334	2.87881
17	3.92335	2.28097	4.17038	3.15633
18	4.35076	2.57313	4.12828	3.78907
19	4.58465	2.77174	4.5486	4.00369
20	4.6797	2.79072	4.47153	4.55503
21	4.72621	2.68633	4.88971	4.79185
22	4.33572	2.67752	5.26864	5.30618
23	3.77973	2.55483	5.21512	5.13967
24	3.88231	2.20709	5.23367	5.73171
25	3.04047	1.82478	5.48415	5.4616
26	2.64862	1.56652	5.62759	5.89453
27	2.3019	1.10897	4.5957	5.28398
28	1.49767	0.79105	4.31168	5.10637
29	1.11676	0.65006	3.658	4.1961
30	0.72148	0.39858	2.85518	4.03329
31	0.47392	0.25894	2.25931	2.7752
32	0.33646	0.17014	1.62277	2.6975
33	0.2079	0.0554	1.04973	1.74653
34	0.12378	0	0.75929	1.50971
35	0	0	0.51309	0.91767
36	0	0	0.3461	0.75485
37	0	0	0.06857	0.36476
38	0	0	0	0.28799
39	0	0	0	0.02723
40	0	0	0	0

