Supplemental information for

A MnO_2-Co_3O_4-CaO Catalytic Pyrolysis Method for Mercury Isotope Analysis in Marine Sediments

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CAPTION OF SUPPLEMENTARY FIGURES AND DATA TABLES

Fig. S1 (a) Hg recovery for standard GSS4a mixed with sample NH1 at different mass ratios via catalytic pyrolysis. (b) Comparison of Hg recovery with/without catalyst for different samples NH2, NH3, HZW, GBW07335 and GBW07336. Error bars represent 1SD.

Fig. S2 Heat map showing correlation between catalytic pyrolysis Hg recovery and content of selected matrix elements in the absorbing solution. Red indicates positive correlation, blue indicates negative correlation; larger circle size indicates stronger correlation.

Fig. S3 Concentration changes of refractory elements (V, Cr, Ni, Mo, U, Ba) in the pyrolysis absorbing solution before and after catalyst addition.

Fig. S4 Concentration changes of moderately volatile elements (Mn, Cu, As, Sb) in the pyrolysis absorbing solution before and after catalyst addition.

Fig. S5 Concentration changes of highly volatile elements (Zn, Tl, Pb, Cd, Te) in the pyrolysis absorbing solution before and after catalyst addition.

Fig. S6 Structural Equation Modeling (SEM) of the Effects of Recovery Efficiency and Refractory, Moderately Volatile, and Highly Volatile Element Contents in the Absorption Solution on Isotopic Composition. (n = 8, composite reliability (rho_c) = 0.862, and average variance extracted (AVE) = 0.571.R^2=0.431 ***P < 0.001, **P < 0.01, *P < 0.05, and P < 0.1. The gray lines indicate nonsignificant paths (P > 0.1)).

Table S1 Mercury concentrations in the samples used in this study.

Table S2 The windows of the mass ratio of catalyst to sediment sample and of catalyst to total mercury in the catalytic pyrolysis of marine sediments.

Table S3 Recoveries and isotopic compositions of real samples (NH1, NH2, HZW) and standard samples (GBW07335, GBW07336) pyrolyzed under conditions with and without catalyst addition.

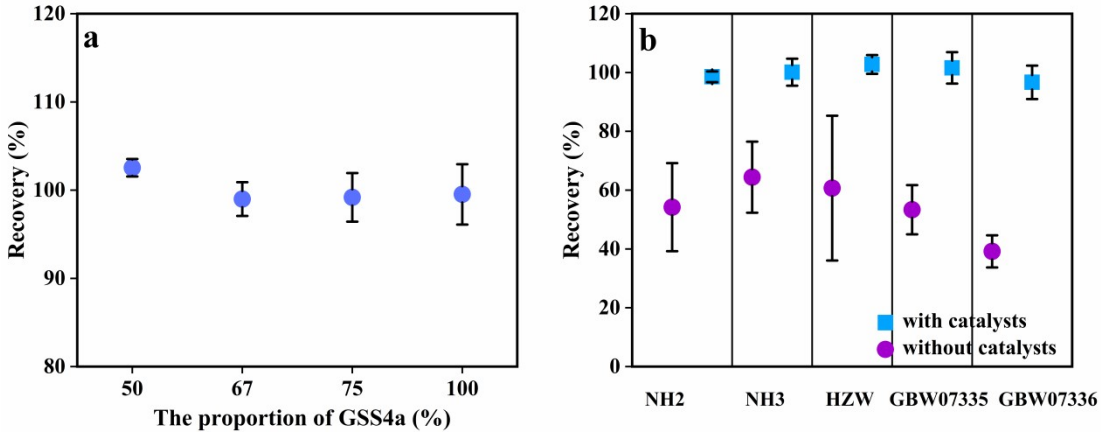

Fig.S1

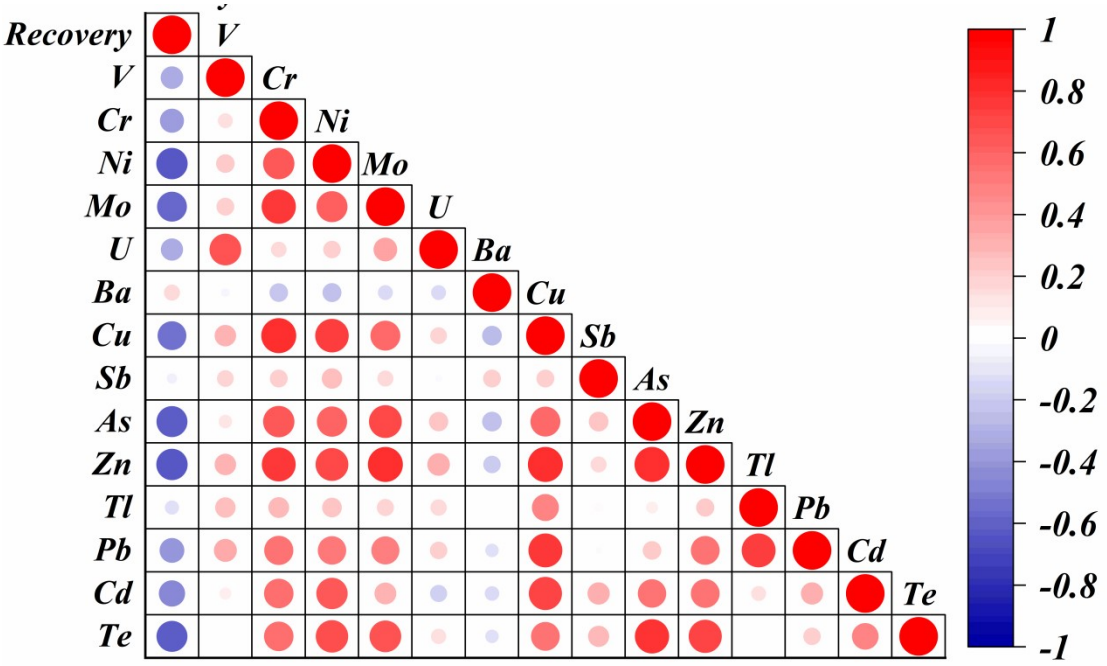

Fig. S2

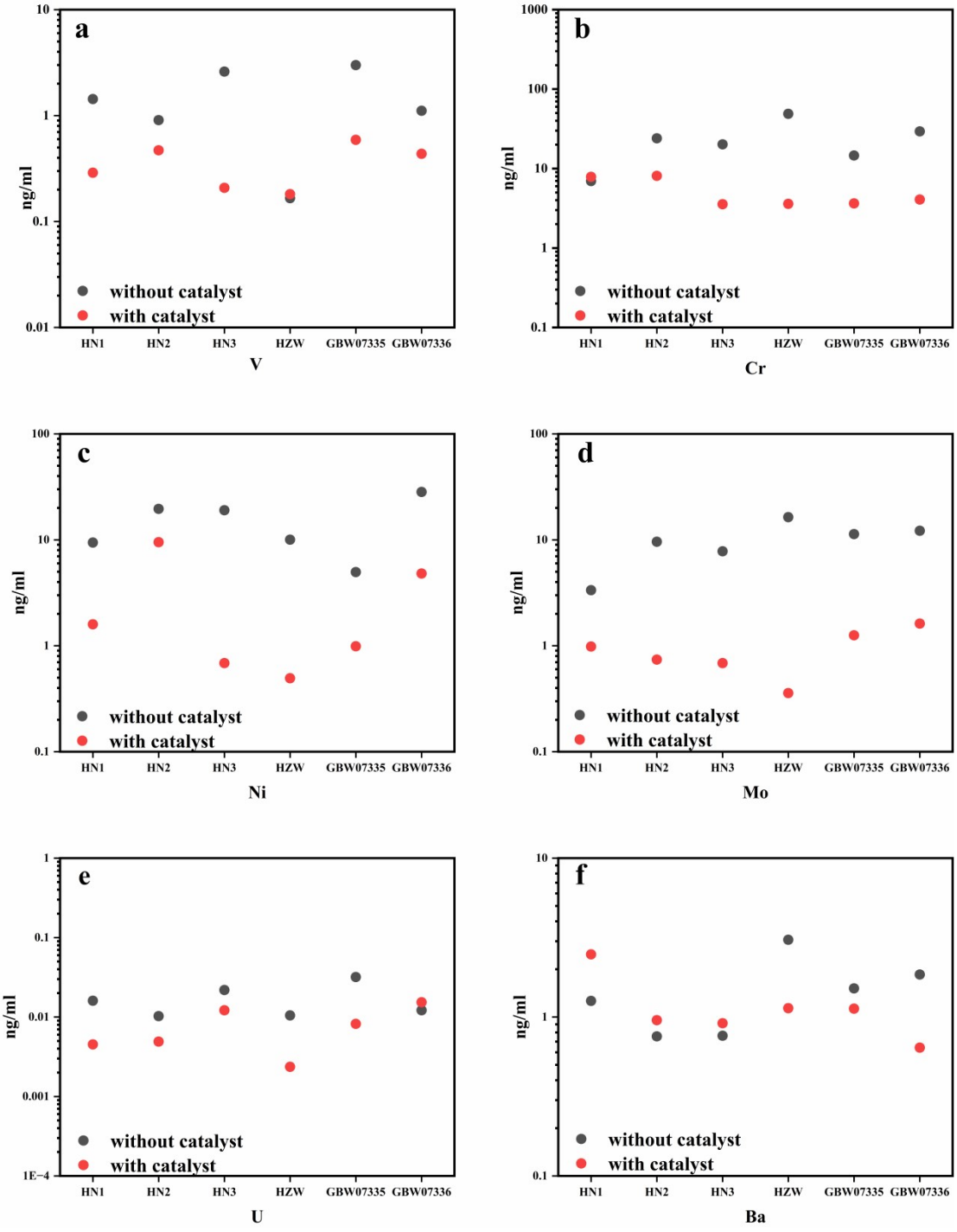
a
ng/ml
10
1
0.1
0.01
without catalyst
with catalyst
HN1
HN2
HN3
HZW
GBW07335
GBW07336
V
b
ng/ml
1000
100
10
1
0.1
without catalyst
with catalyst
HN1
HN2
HN3
HZW
GBW07335
GBW07336
Cr
c
ng/ml
100
10
1
0.1
without catalyst
with catalyst
HN1
HN2
HN3
HZW
GBW07335
GBW07336
Ni
d
ng/ml
100
10
1
0.1
without catalyst
with catalyst
HN1
HN2
HN3
HZW
GBW07335
GBW07336
Mo
e
ng/ml
1
0.1
0.01
0.001
1E−4
without catalyst
with catalyst
HN1
HN2
HN3
HZW
GBW07335
GBW07336
U
f
ng/ml
10
1
0.1
without catalyst
with catalyst
HN1
HN2
HN3
HZW
GBW07335
GBW07336
Ba

Fig. S3

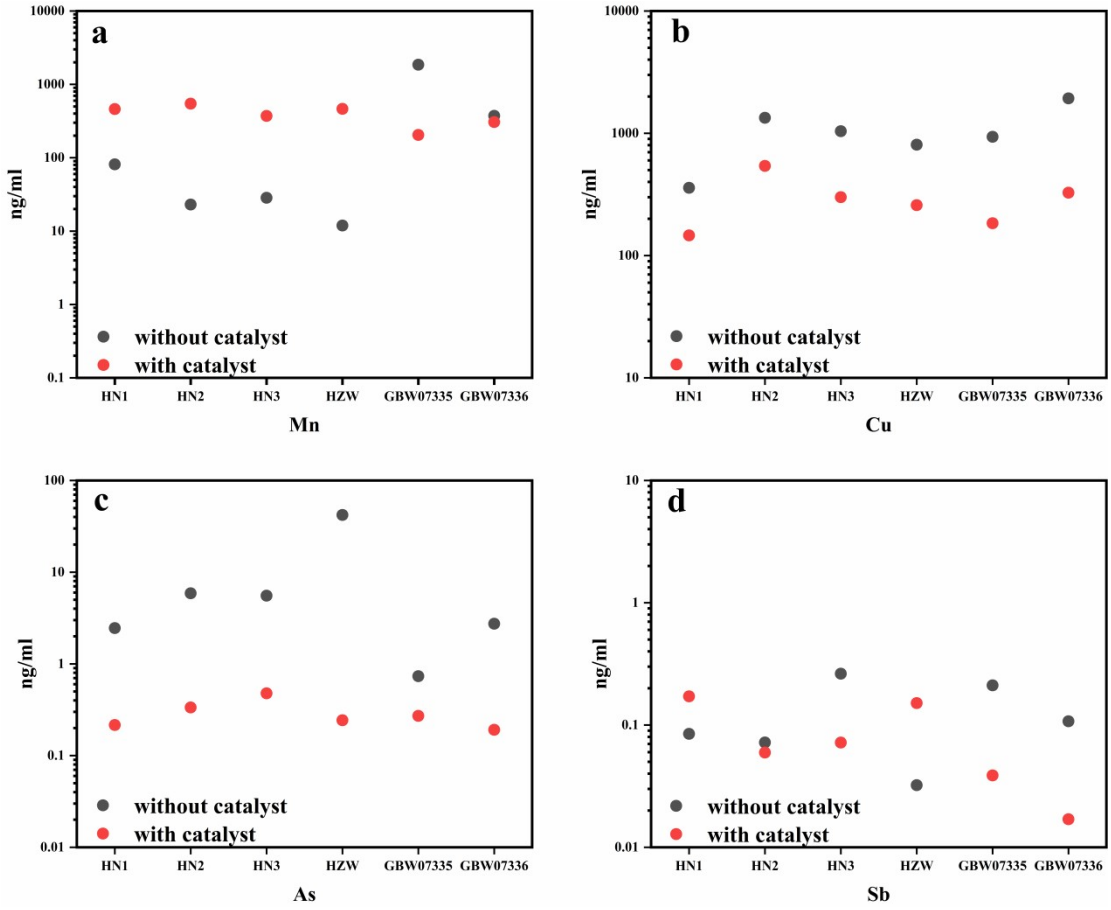
a
b
c
d
ng/ml
without catalyst
with catalyst
HN1
HN2
HN3
HZW
GBW07335
GBW07336
Mn
Cu
As
Sb

Fig. S4

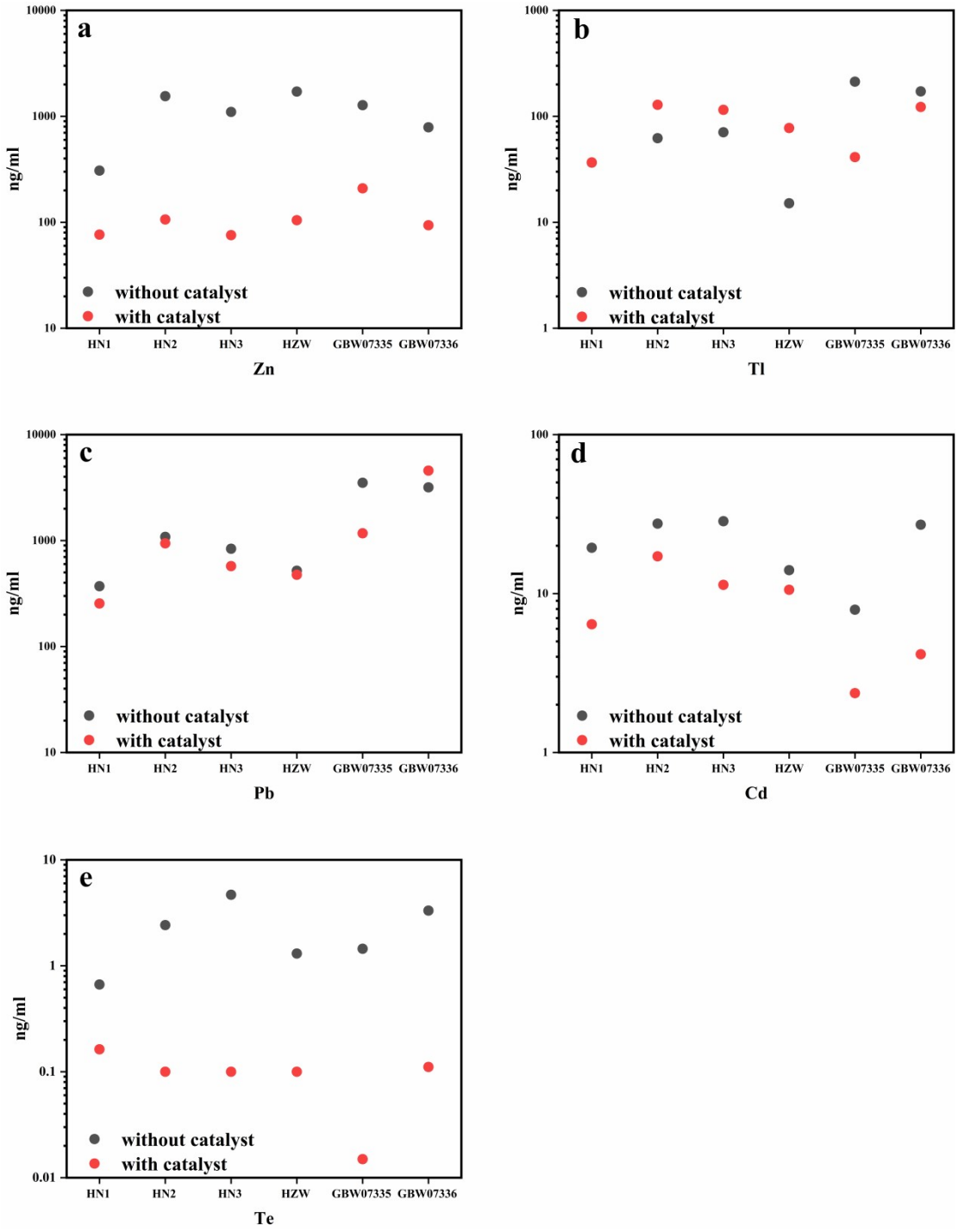
a
ng/ml
10000
1000
100
10
without catalyst
with catalyst
HN1
HN2
HN3
HZW
GBW07335
GBW07336
Zn
b
ng/ml
1000
100
10
1
without catalyst
with catalyst
HN1
HN2
HN3
HZW
GBW07335
GBW07336
Tl
c
ng/ml
10000
1000
100
10
without catalyst
with catalyst
HN1
HN2
HN3
HZW
GBW07335
GBW07336
Pb
d
ng/ml
100
10
1
without catalyst
with catalyst
HN1
HN2
HN3
HZW
GBW07335
GBW07336
Cd
e
ng/ml
10
1
0.1
0.01
without catalyst
with catalyst
HN1
HN2
HN3
HZW
GBW07335
GBW07336
Te

Fig. S5

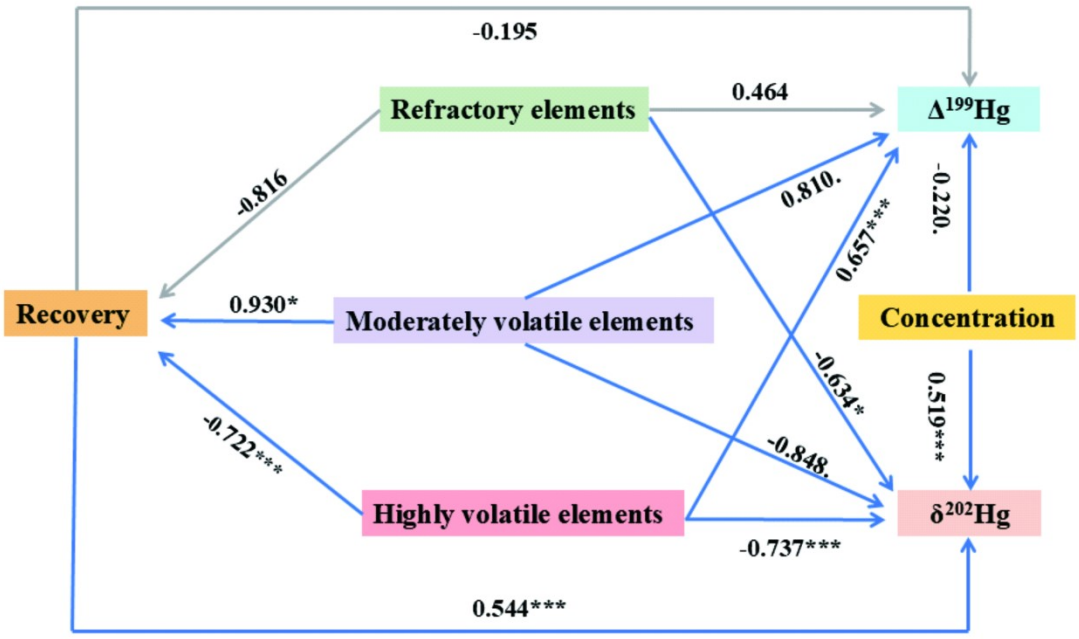

Fig. S6

Table S1

Sample ID	Concentration THg (ng/g)	Standard Deviation	Replicate Analysis (n)
GSS4a	72	2	6
GSS5a	724	26.7	5
GBW07335	19	1	5
GBW07336	35	1	5
NH1	223	8	6
NH2	56	2	6
NH3	38	1	6

Table S2

Catalyst/Sample (w/w, g/g)	Total mercury/catalyst (w/w, ng/g)	Recovery (%)	δ^{202}Hg (‰)	Δ^{199}Hg (‰)
27	2	89.8	-0.46	0.20
25	2	91.9	-0.44	0.19
24	2	99.3	-0.48	0.20
24	2	96.9	-0.67	0.19
23	2	94.2	-0.65	0.23
22	2	89.2	-0.76	0.18
21	2	103.4	-0.51	0.22
20	2	109.9	-0.57	0.22
17	3	64.9	-0.18	0.14
16	3	56.9	-0.18	0.16
15	3	57.4	-0.18	0.20
12	4	38.4	-1.60	0.35
10	5	38.7	-0.33	0.19

Table S3

Method	Sample	Recovery (%, 1SD)	δ^{202}Hg (‰, 1SD)	Δ^{199}Hg (‰, 1SD)	n
Without catalyst	NH1	36.6 ± 16.3	-1.15 ± 0.20	0.26 ± 0.02	3
	NH2	57.2 ± 19.2	-1.71 ± 0.54	0.15 ± 0.06	3
	HZW	78.1 ± 2.3	-4.03 ± 0.10	0.22 ± 0.01	3
	GBW07335	53.4 ± 8.4	-1.24 ± 0.01	-0.12 ± 0.05	2
	GBW07336	39.2 ± 5.5	-1.74 ± 0.07	-0.09 ± 0.06	2
with catalyst	NH1	100.9 ± 1.9	-0.54 ± 0.08	0.21 ± 0.01	5
	NH2	99.8 ± 1.7	-1.39 ± 0.18	-0.17 ± 0.05	3
	HZW	96.9 ± 7.1	-3.52 ± 0.11	-0.11 ± 0.05	3
	GBW07335	101.6 ± 5.4	-1.24 ± 0.08	-0.08 ± 0.03	2
	GBW07336	96.7 ± 5.7	-1.38 ± 0.10	-0.11 ± 0.02	2