

Supporting Information for

ZSM-5 ADDITIVE DEACTIVATION WITH NICKEL AND VANADIUM METALS IN THE FLUID CATALYTIC CRACKING (FCC) PROCESS

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Table S1: Weight percentage yields of VGO cracking products, gasoline composition and HTI at constant 65% conversion.

		No Metals		Low Metals		High Metals	
FCC catalyst, wt%	100	95	90	95	90	95	90
ZSM-5 additive, wt%	0	5	10	5	10	5	10
Paraffins							
n-C ₁	0.37	0.37	0.37	0.37	0.37	0.37	0.37
n-C ₂	0.30	0.30	0.30	0.30	0.30	0.30	0.30
n-C ₃	0.56	0.86	1.16	0.86	1.16	0.86	1.16
n-C ₄	0.72	0.77	0.80	0.77	0.80	0.77	0.80
n-C ₅	0.50	0.53	0.54	0.53	0.54	0.53	0.54
C ₆ total	4.40	3.47	3.35	3.47	3.35	3.47	3.35
n-C ₇ -C ₁₂	0.71	0.64	0.62	0.64	0.62	0.64	0.62
i-C ₄	1.78	2.60	2.50	2.60	2.50	2.60	2.50
i-C ₅	2.68	2.68	2.53	2.68	2.53	2.68	2.50
i-C ₇ -C ₁₂	3.97	2.19	1.57	2.19	1.57	2.19	1.57
Olefins							
C ₂	0.43	0.91	1.42	0.91	1.42	0.73	1.11
C ₃	4.15	9.20	11.39	9.20	11.39	8.31	10.50
n-C ₄	5.81	7.36	7.66	7.36	7.66	7.36	7.66
i-C ₄	2.59	3.75	4.25	3.75	4.25	3.75	4.25
C ₅	10.69	10.69	9.99	10.69	9.99	11.77	10.69
C ₆ total	4.40	3.47	3.35	3.47	3.35	3.47	3.35
C ₇ -C ₉	5.07	2.27	1.68	2.27	1.68	2.27	1.68
Total C ₃ and C ₄ olefins	12.55	20.35	23.21	19.66	23.13	19.43	22.40
C ₄ olefins	8.40	11.11	11.91	11.11	11.91	11.11	11.91
HTI (i-C₄)/(i-C₄=)							
	0.76	0.69	0.58	0.69	0.58	0.69	0.58
C₃=/i-C₄=, (cracking severity for ZSM-5)							
	1.60	2.46	2.67	2.46	2.67	2.22	2.47
Naphtenes							
C ₆ -C ₁₀ Naphtenes	2.95	2.10	1.72	2.10	1.72	2.10	1.72
Aromatics							
C ₆ -C ₁₀ Aromatics	10.19	8.74	8.14	8.74	8.14	8.74	8.14
Olefinicities in LPG range, %							
C ₃ Olefinicity	88.05	91.48	90.78	91.48	90.78	90.67	90.11

C₄ Olefinicity	77.03	76.70	78.27	76.70	78.27	76.70	78.27
Gasoline Composition, %							
n-Paraffins	3.11	3.94	4.71	3.94	4.71	3.94	4.40
i-Paraffins	16.73	13.37	10.96	13.37	10.96	13.37	10.96
Aromatics	38.24	48.25	52.54	48.25	52.54	48.25	52.54
Naphthenes	11.29	11.82	11.48	11.82	11.48	11.82	11.48
Olefins	30.09	22.32	19.80	22.32	19.80	22.32	20.55
Yields at 65% conversion, wt%							
H ₂	0.05	0.06	0.05	0.06	0.07	0.07	0.09
Coke	0.75	0.87	1.10	0.87	1.10	0.87	1.10
Coke on catalyst	0.52	0.58	0.65	0.58	0.65	0.58	0.65
C ₁ +C ₂	1.18	1.58	2.09	1.58	2.09	1.40	1.78
LPG	15.61	24.54	27.77	24.54	27.77	23.64	26.86
Gasoline	47.43	37.56	33.96	37.56	33.96	38.64	35.49
LCO	15.66	15.18	14.31	15.18	14.31	15.18	14.31
HCO	19.34	19.82	20.69	19.82	20.69	19.82	20.69
Activity							
C/O at 65%	1.89	1.89	1.89	1.89	1.77	1.89	1.89
Conversion at C/O=1.8	66.95	66.95	66.95	66.95	77.28	66.95	66.95
RON	90.18	92.62	93.98	92.62	93.98	92.62	93.98

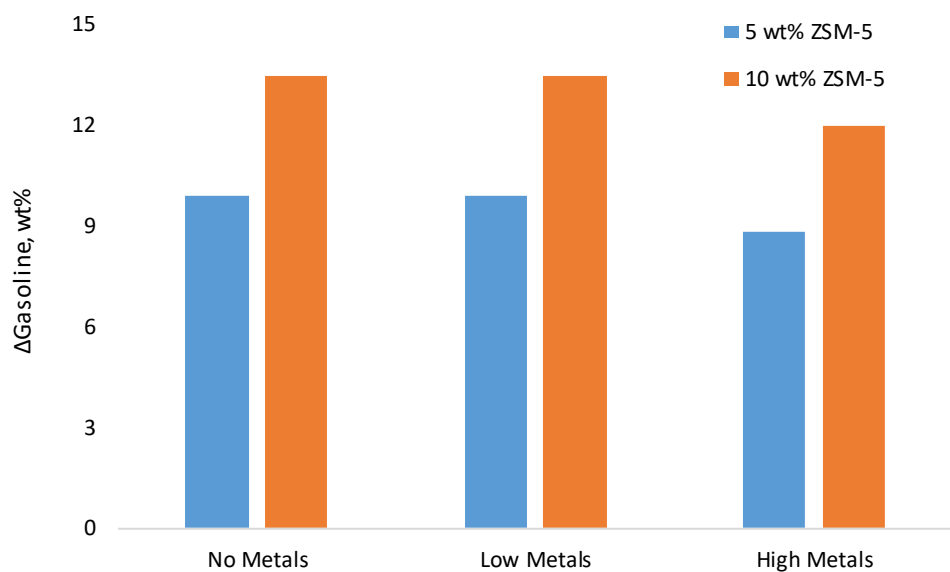


Figure S1: Gasoline Δ yields at constant 65%wt VGO conversion

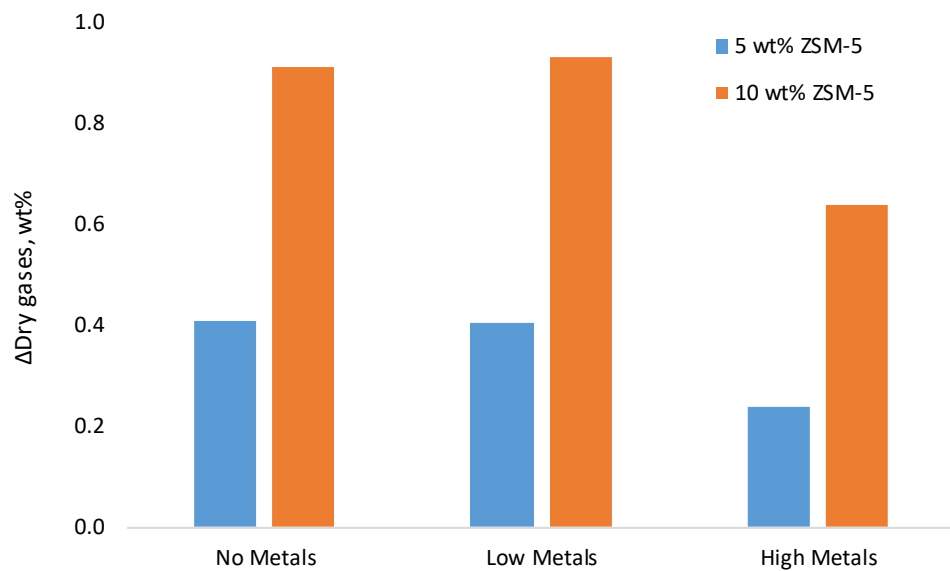


Figure S2: Dry Gases Δ yields at constant 65%wt VGO conversion

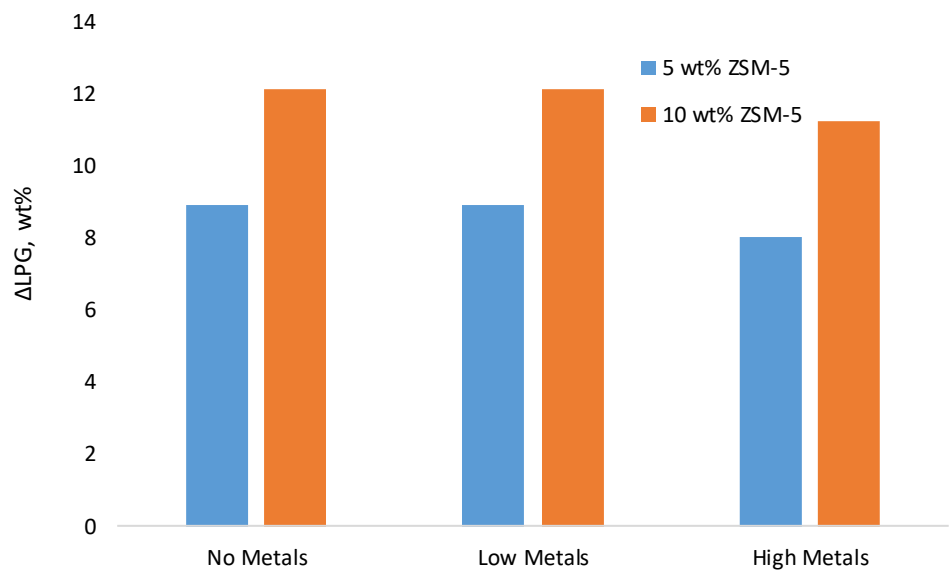


Figure S3: LPG Δ yields at constant 65%wt VGO conversion

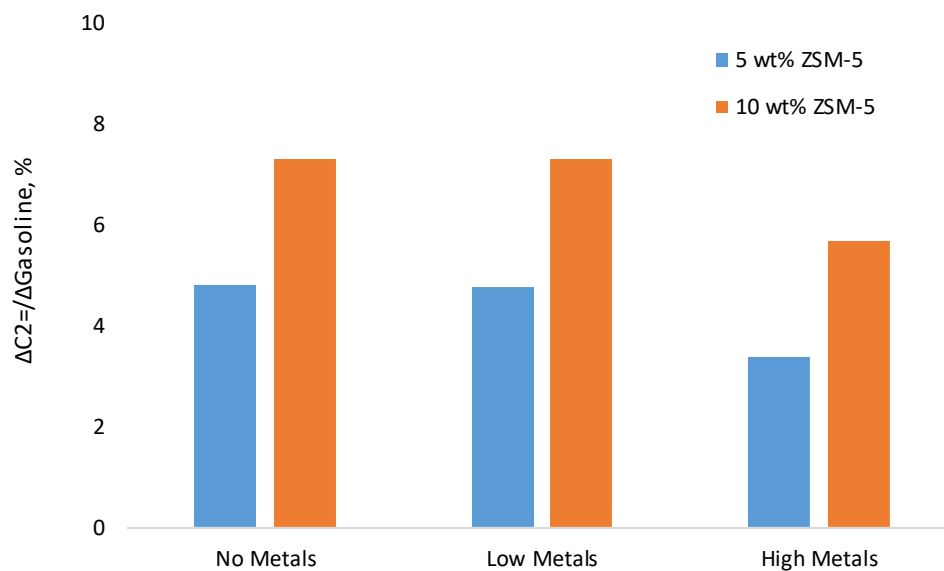


Figure S4: Ethylene selectivity of deactivated ZSM-5 additives at 65%wt VGO conversion

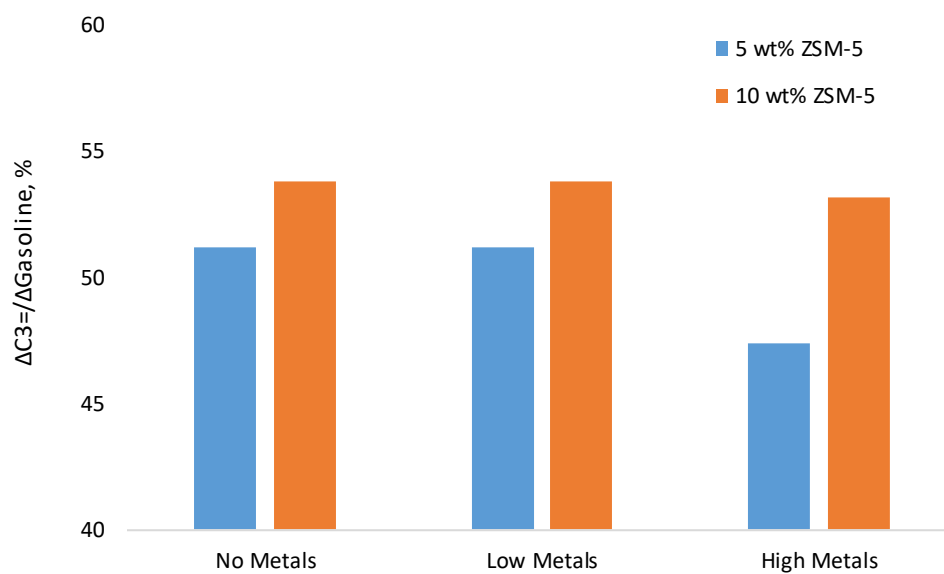


Figure S5: Propylene selectivity of deactivated ZSM-5 additives at 65%wt VGO conversion

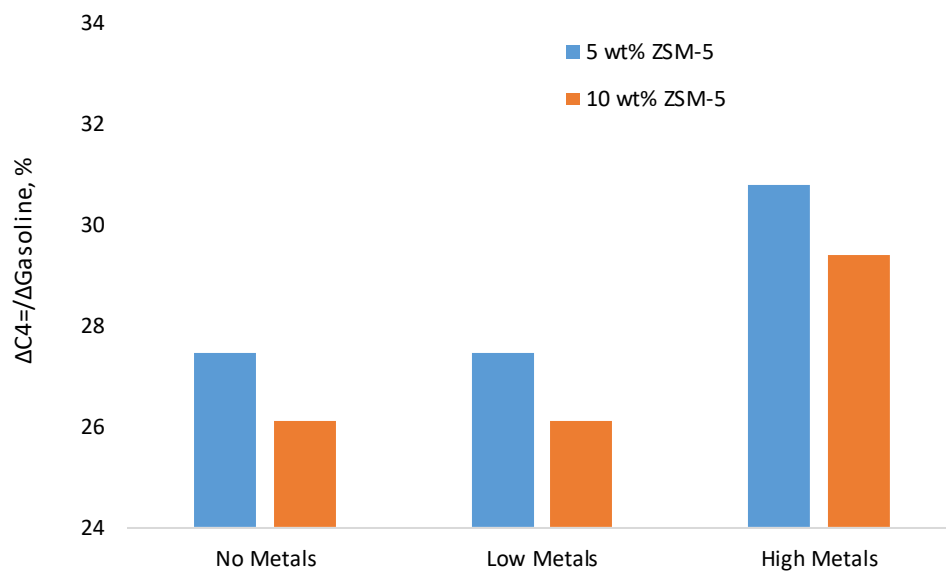


Figure S6: Butylene selectivity of deactivated ZSM-5 additives at 65%wt VGO conversion