

Appendix

Table A1 Catalytic performance of Si/HZSM-5, Zn/HZSM-5, and Zn/Si/HZSM-5 catalysts

	Catalysts	Aromatics (wt%)	B (wt%)	T (wt%)	X (wt%)	p-X/X (wt%)	P (wt%)	Alkenes (wt%)	Alkanes (wt%)	P/BT (Molar ratio)	Reaction condition	Sample time (h)	Ref.
Zn-modified HZSM-5 catalysts	5 wt% Zn/HZSM-5 (HZSM-5 SiO ₂ /Al ₂ O ₃ = 38)	56.6 (36.3)	2.0 (2.3)	17.7 (12.0)	24.4 (13.9)	24.2 (23.7)	2.2 (1.2)	5.4 (2.9)	23.3 (43.7)	0.2 (0.2)	420 °C, 0.1 MPa, weight hourly space velocity (WHSV) = 2.1 h ⁻¹ , N ₂ flow rate = 30 ml/min	4	9
	1.5wt% Zn/HZSM-5 (HZSM-5 SiO ₂ /Al ₂ O ₃ = 38)	50.9 (27.7)	2.3 (2.8)	9.5 (8.6)	26.9 (10.0)	72.4 (69.5)	4.8 (3.6)	11.5 (7.5)	14.3 (41.0)	0.9 (0.7)	475 °C, 0.1 MPa, WHSV = 1 h ⁻¹ , N ₂ flow rate = 30.8 ml/min	2.25	10
	1 wt% Zn/HZSM-5 (HZSM-5 SiO ₂ /Al ₂ O ₃ = 60)	49.5 (24.8)	4.0 (1.6)	17.8 (6.7)	21.1 (11.7)	n.a.	14.4 (22.1)	31.1 (39.5)	10.3 (27.9)	1.4 (5.6)	450 °C, 0.1 MPa, WHSV = not given, N ₂ flow rate = 88 ml/min	12	11
	1 wt% Zn/HZSM-5 (HZSM-5 SiO ₂ /Al ₂ O ₃ = 30)	65.9 (38.4)	4.9 (2.1)	14.9 (5.6)	25.9 (14.1)	24.1 (23.5)	2.1 (2.3)	4.6 (5.4)	26.0 (48.8)	0.2 (0.6)	460 °C, 0.1 MPa, WHSV = 1 h ⁻¹ , N ₂ flow rate = 80 ml/min	0.5	13
Silica deposited HZSM-5 catalysts	SiO ₂ /HZSM-5 (HZSM-5 SiO ₂ /Al ₂ O ₃ = 30)	33.8 (38.4)	8.3 (2.1)	10.2 (5.6)	12.8 (14.1)	97.3 (23.5)	4.3 (2.3)	8.9 (5.4)	49.7 (48.8)	0.5 (0.6)	460 °C, 0.1 MPa, WHSV = 1 h ⁻¹ , N ₂ flow rate = 80 ml/min	0.5	13
	SiO ₂ /HZSM-5 (HZSM-5 SiO ₂ /Al ₂ O ₃ = 50)	27.4 (37.5)	7.0 (7.9)	8.9 (9.5)	9.5 (12.5)	98.1 (24.0)	14.0 (0.7)	36.3 (2.3)	34.4 (59.5)	1.8 (0.1)	400 °C, 0.1 MPa, WHSV = 1 h ⁻¹ , N ₂ flow rate = 40 ml/min	0.5	16
	SiO ₂ /HZSM-5 (HZSM-5 SiO ₂ /Al ₂ O ₃ = 200)	23.1 (35.4)	5.9 (8.3)	7.0 (9.8)	8.8 (12.3)	96.3 (24.2)	28.2 (6.5)	55.4 (11.9)	18.3 (50.7)	4.4 (0.7)			
Zn-modified Si/ HZSM-5	0.73 wt% Zn/HZSM-5/SiO ₂ (Si/HZSM-5 SiO ₂ /Al ₂ O ₃ = 28)	36.6 (27.4)	0.8 (1.2)	11.0 (8.1)	18.8 (12.9)	94.8 (93.2)	n.a.	n.a.	n.a.	n.a.	450 °C, 0.1 MPa, WHSV = 2.3 h ⁻¹	2	12
	1 wt% Zn/Si/HZSM-5 (Si/HZSM-5 SiO ₂ /Al ₂ O ₃ = 30)	59.8 (33.8)	14.2 (8.3)	18.6 (10.2)	22.7 (12.8)	97.8 (97.3)	3.4 (4.3)	6.7 (8.9)	27.7 (49.7)	0.2 (0.5)	460 °C, 0.1 MPa, WHSV = 1 h ⁻¹ , N ₂ flow rate = 80 ml/min	0.5	13
	3 wt% ZnO/Si/HZSM-5 (Si/HZSM-5 SiO ₂ /Al ₂ O ₃ = 25)	28.8 (n.a.)	n.a.	n.a.	n.a.	86.6 (n.a.)	8.8 (n.a.)	n.a.	n.a.	n.a.	475 °C, 0.1 MPa, WHSV = 0.79 h ⁻¹	0.5	14
The methanol conversion is ~100% over all these catalysts.													