

Figure 1. Change in (a) CO conversion, (b) (H₂+CO) conversion, and (c) H₂/CO usage ratio with time on stream in run SB-3115 with the 100 Fe/3 Cu/4 K/2 Ca/16 SiO₂ catalyst, and their comparison with run SA-1665.

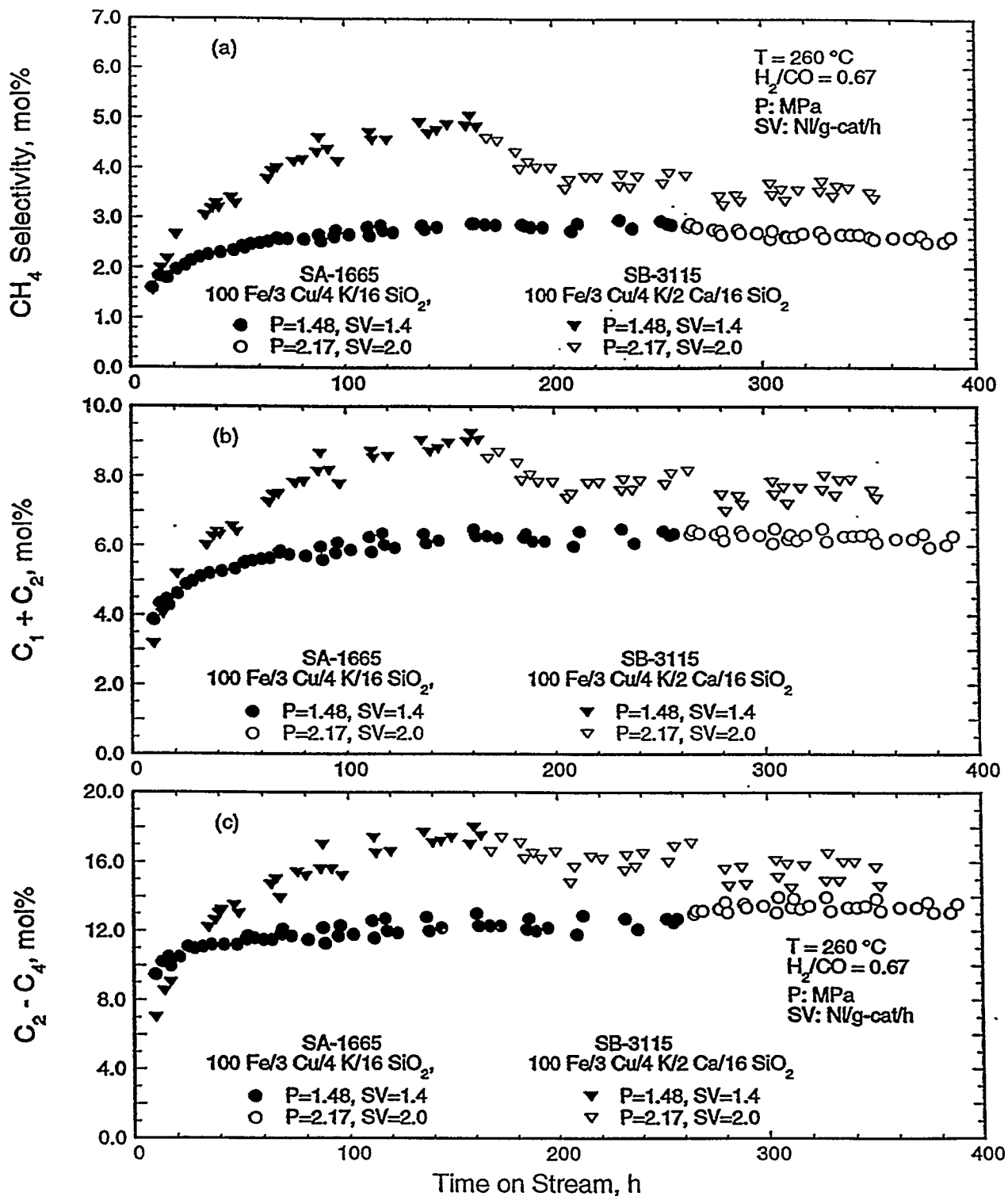


Figure 2. Change in (a) methane selectivity, (b) C₁+C₂ selectivity and (c) C₂-C₄ selectivity with time on stream in run SB-3115 with the 100 Fe/3 Cu/4 K/2 Ca/16 SiO₂ catalyst, and their comparison with run SA-1665.

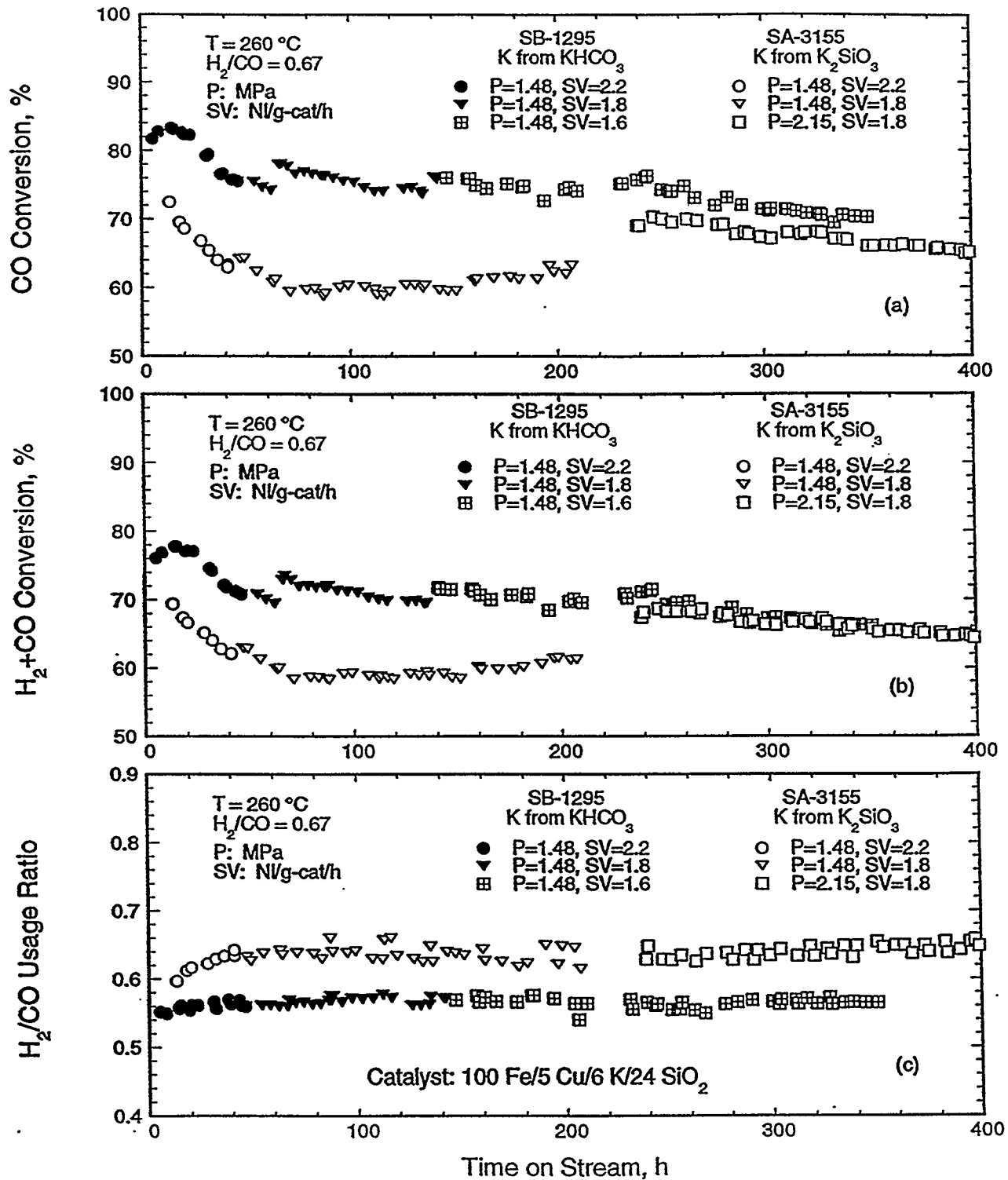


Figure 3. Change in (a) CO conversion, (b) ($\text{H}_2 + \text{CO}$) conversion, and (c) H_2/CO usage ratio with time on stream in run SA-3155 with the 100 Fe/5 Cu/6 K/24 SiO_2 catalyst and comparison with run SB-1295.

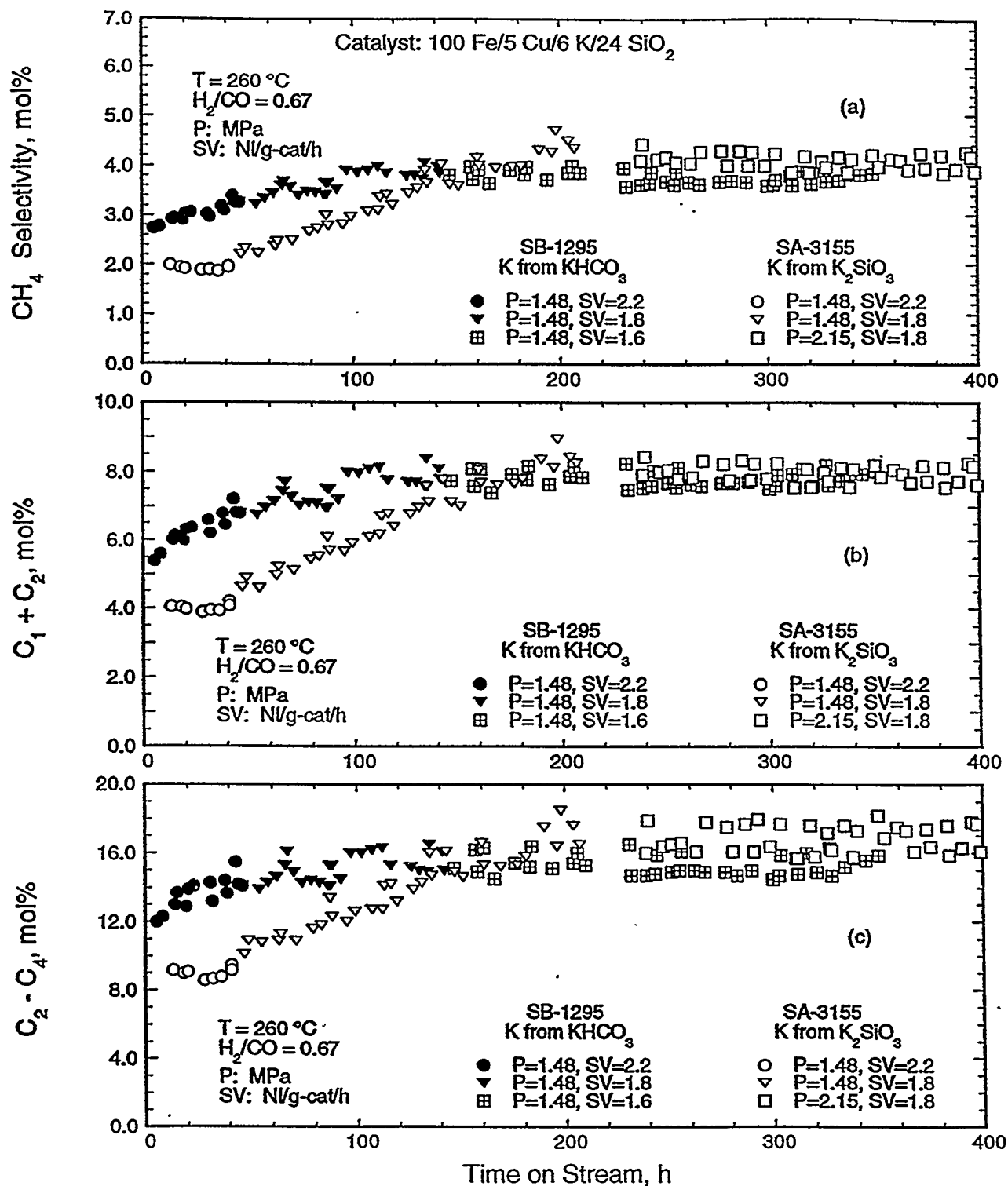


Figure 4. Change in (a) methane selectivity, (b) C₁+C₂ selectivity and (c) C₂-C₄ selectivity with time on stream in run SA-3155 with the 100 Fe/5 Cu/6 K/24 SiO₂ catalyst and comparison with run SB-1295.

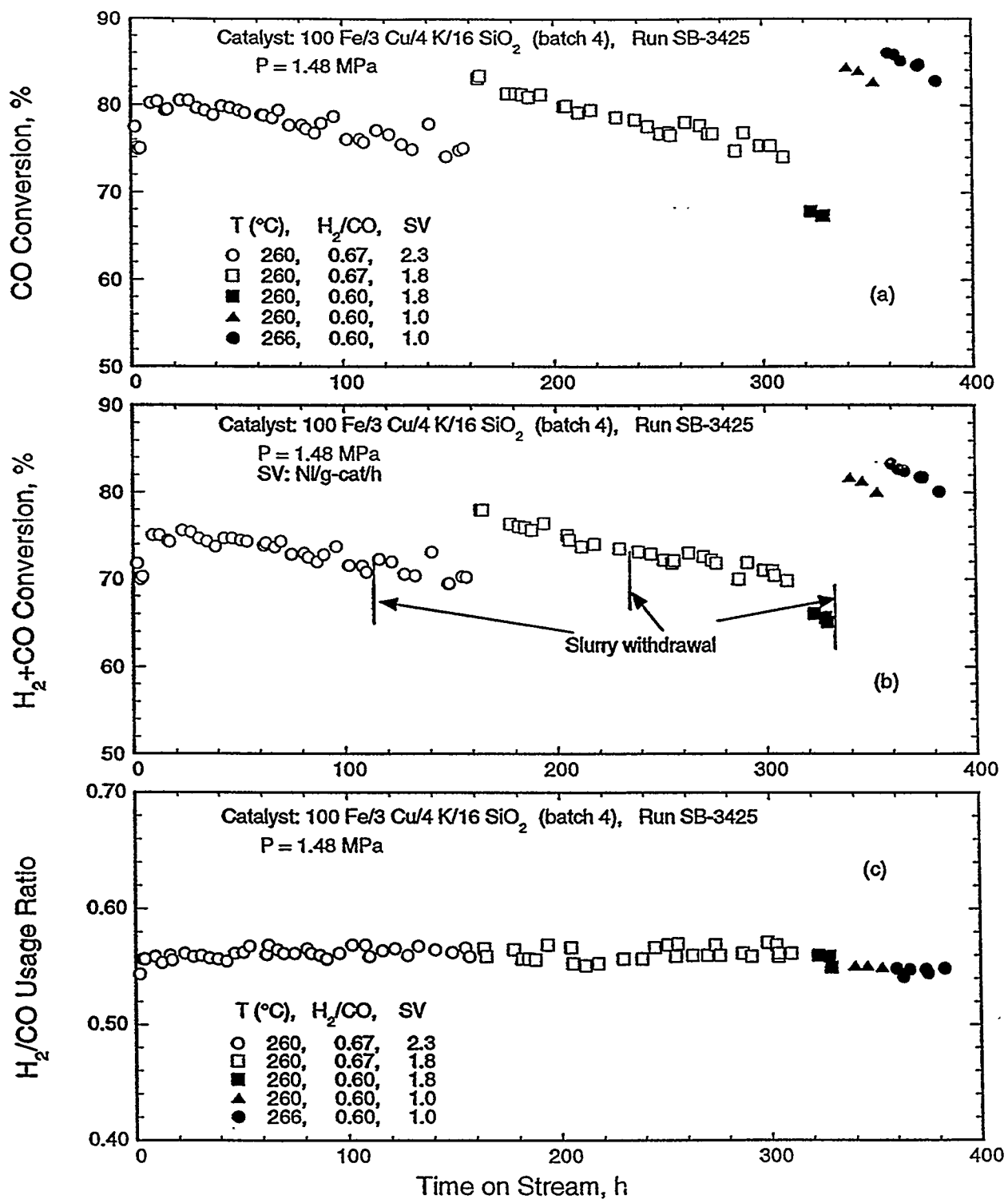


Figure 5. Variations in (a) CO conversion, (b) (H₂+CO) conversion, and (c) H₂/CO usage ratio with time on stream in run SB-3425 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

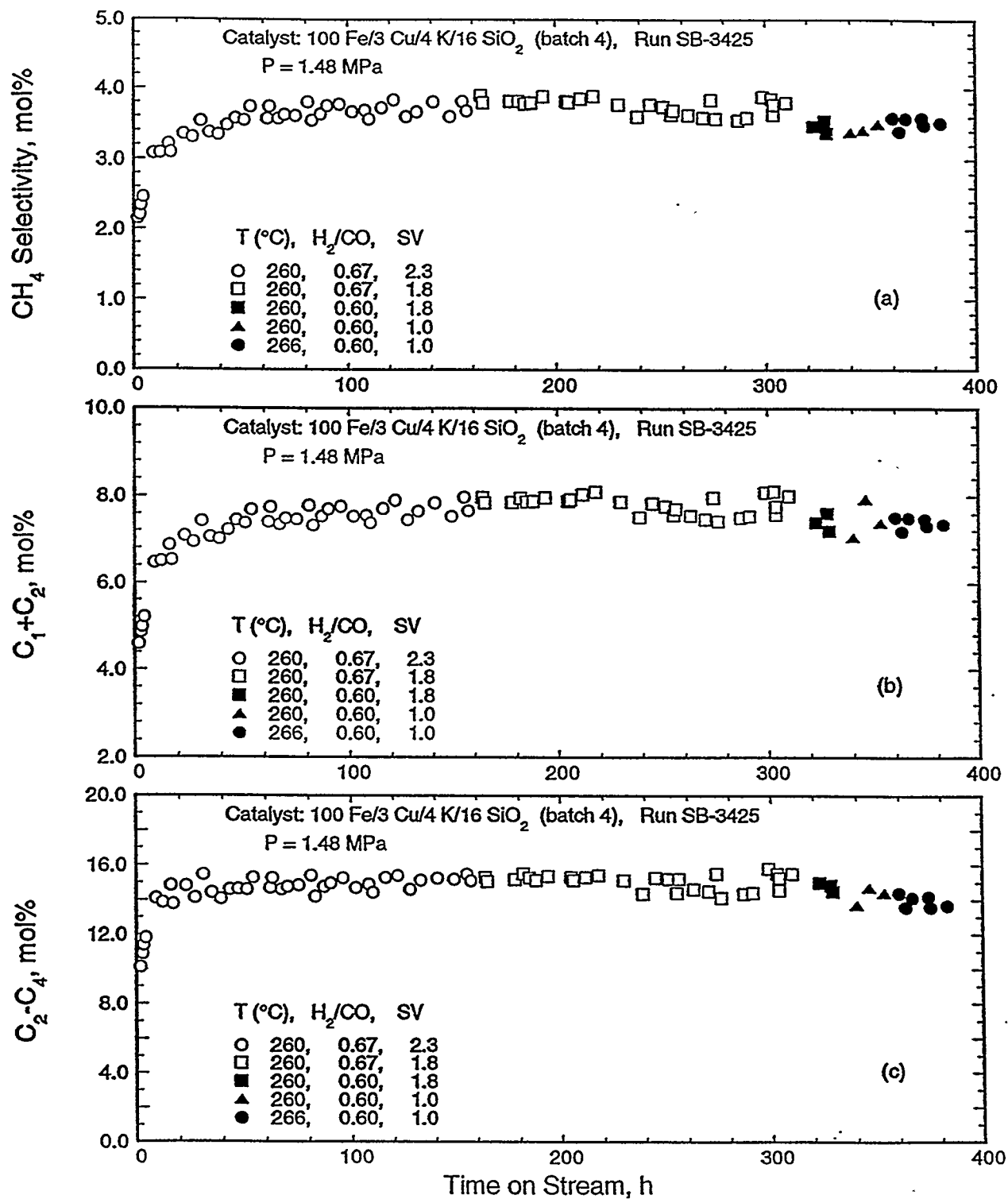


Figure 6. Variations in (a) methane selectivity, (b) C₁+C₂ selectivity and (c) C₂-C₄ selectivity with time on stream in run SB-3425 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

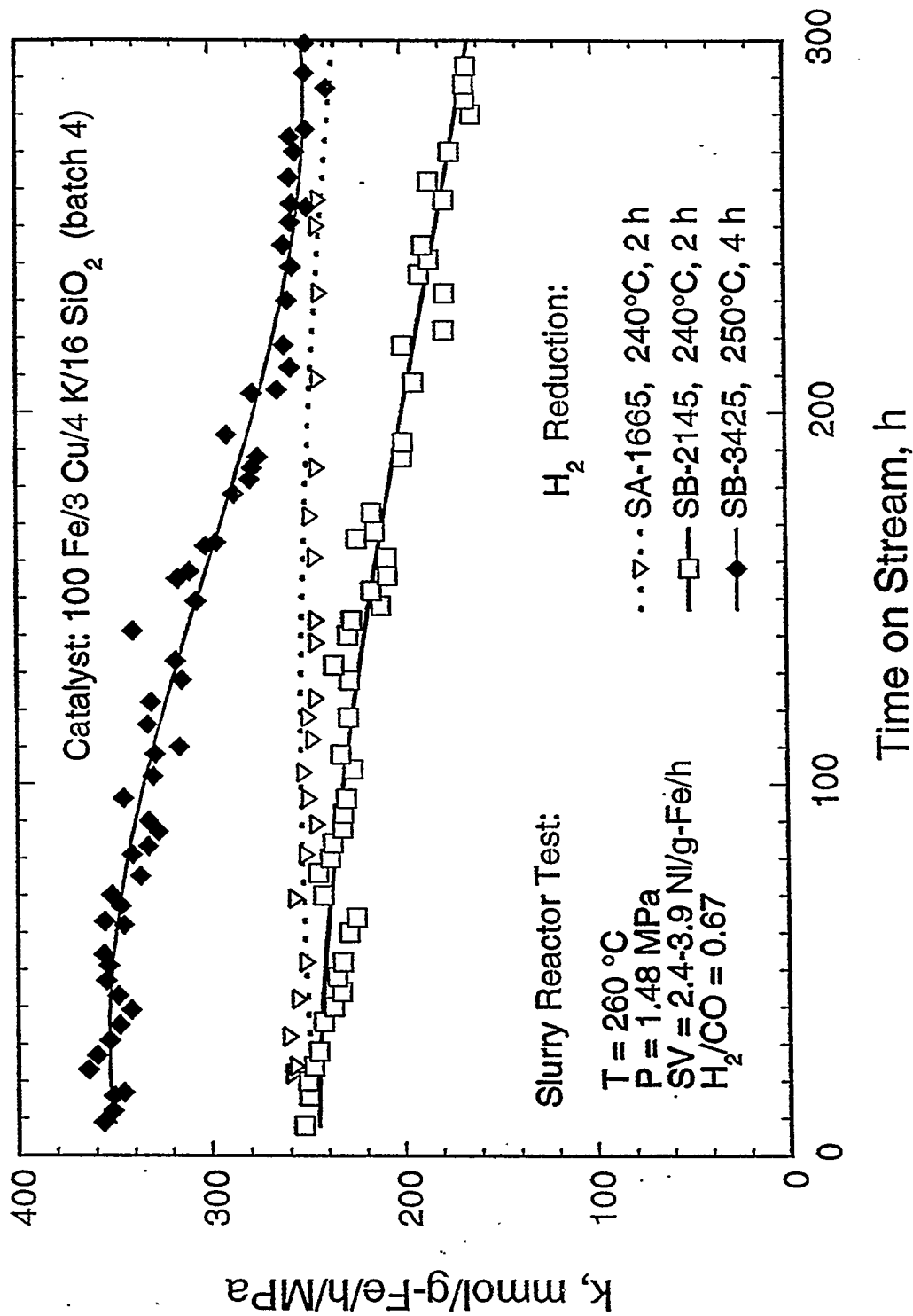


Figure 7. Comparison of an apparent first order reaction rate constant among runs SA-1665, SB-2145 and SB-3425 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

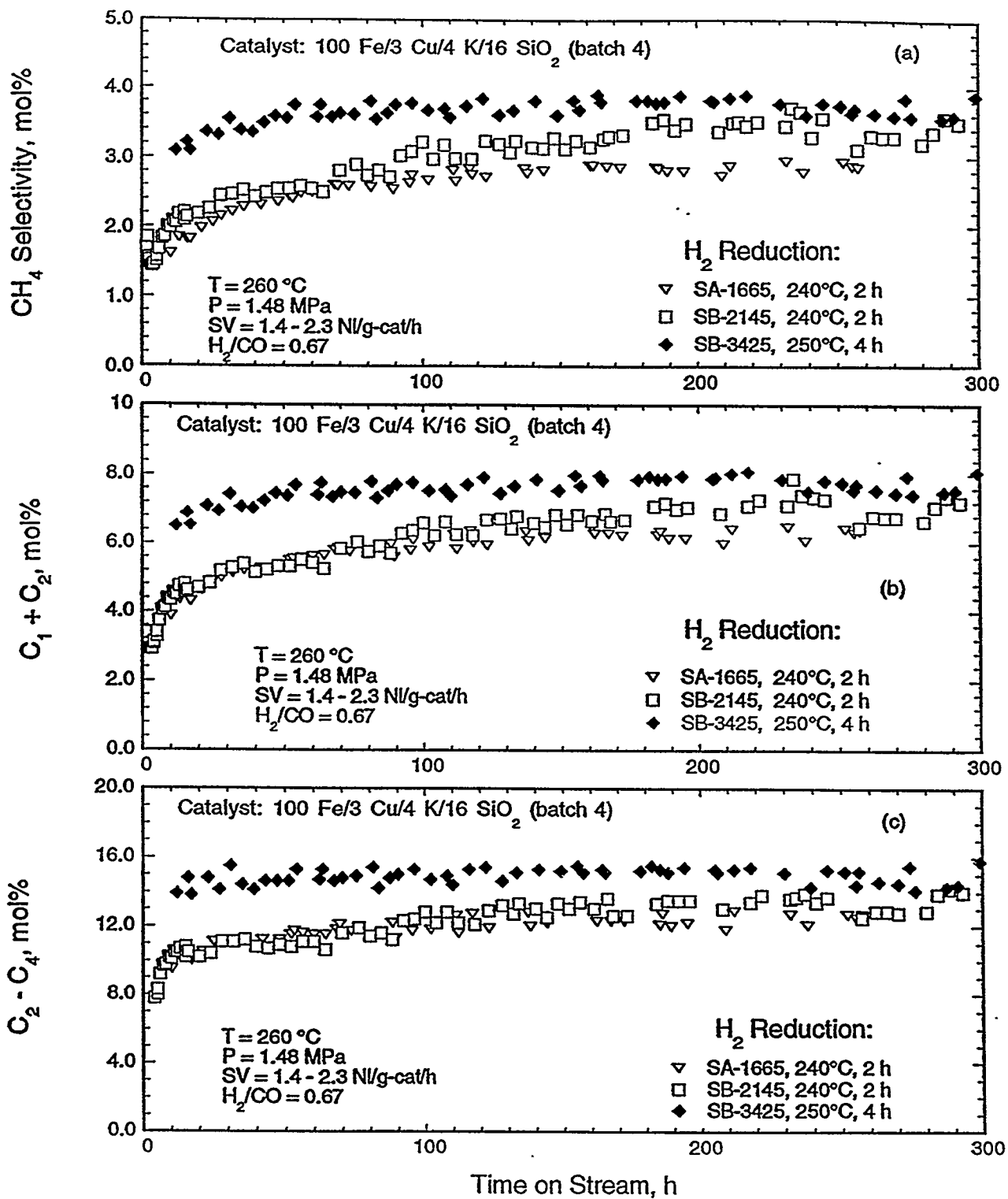


Figure 8. Comparison of (a) methane selectivity, (b) C₁+C₂ selectivity and (c) C₂-C₄ selectivity among runs SA-1665, SB-2145 and SB-3425 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

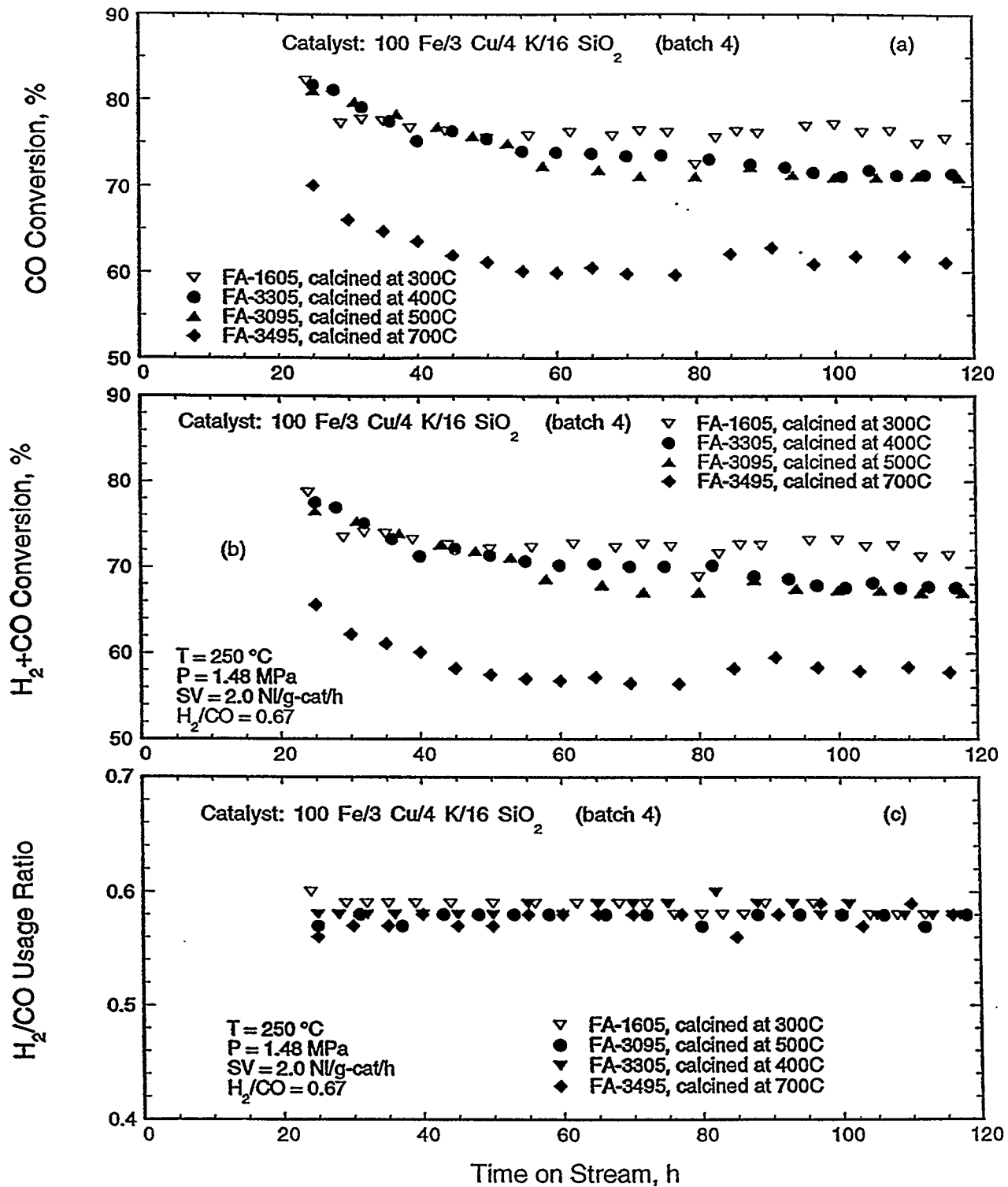


Figure 9. Effect of calcination conditions on (a) CO conversion, (b) (H₂+CO) syngas conversion, and (c) H₂/CO usage ratio in FBR tests with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

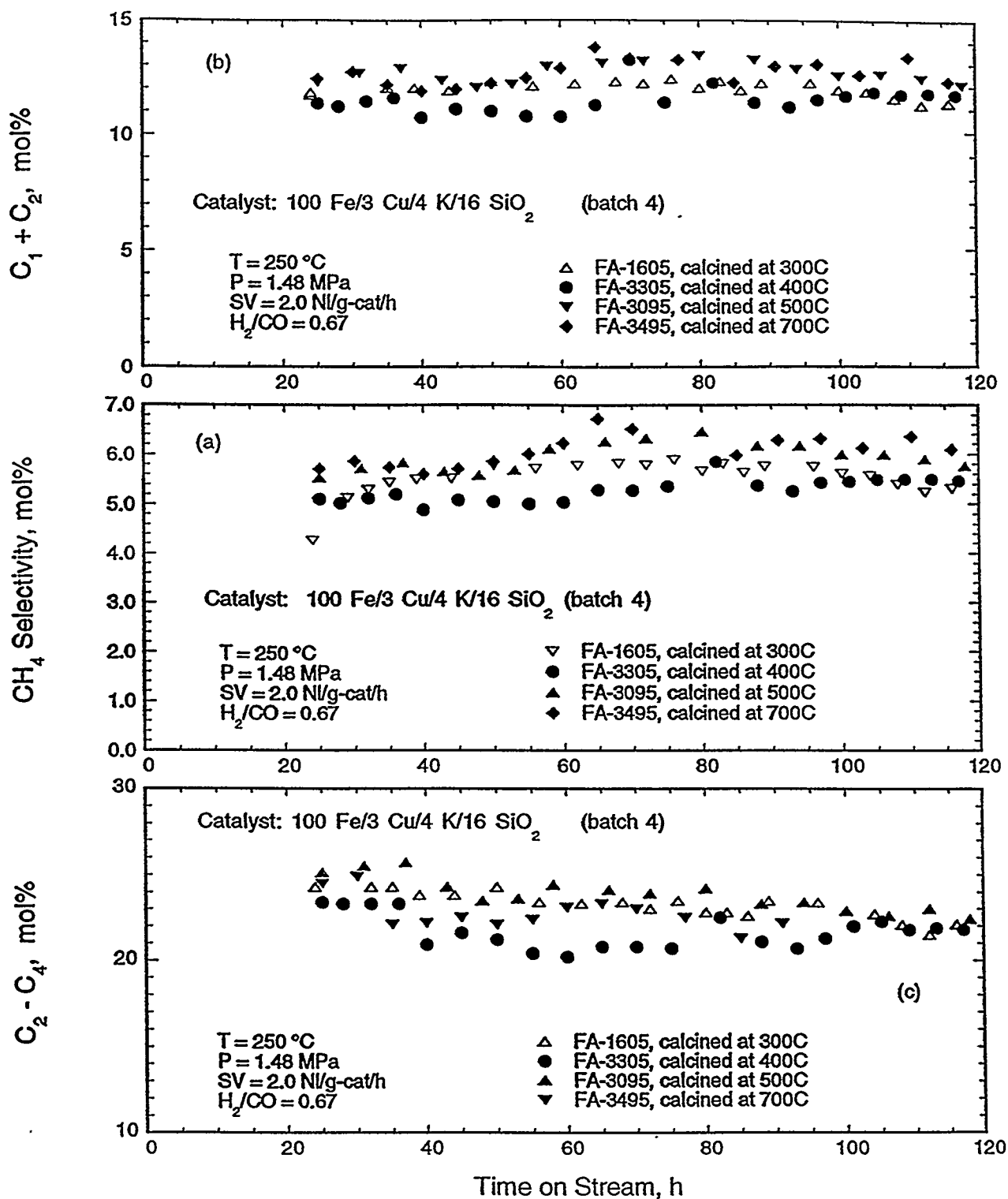


Figure 10. Effect of calcination conditions on (a) methane selectivity, (b) C₁+C₂ selectivity and (c) C₂-C₄ selectivity in FBR tests with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

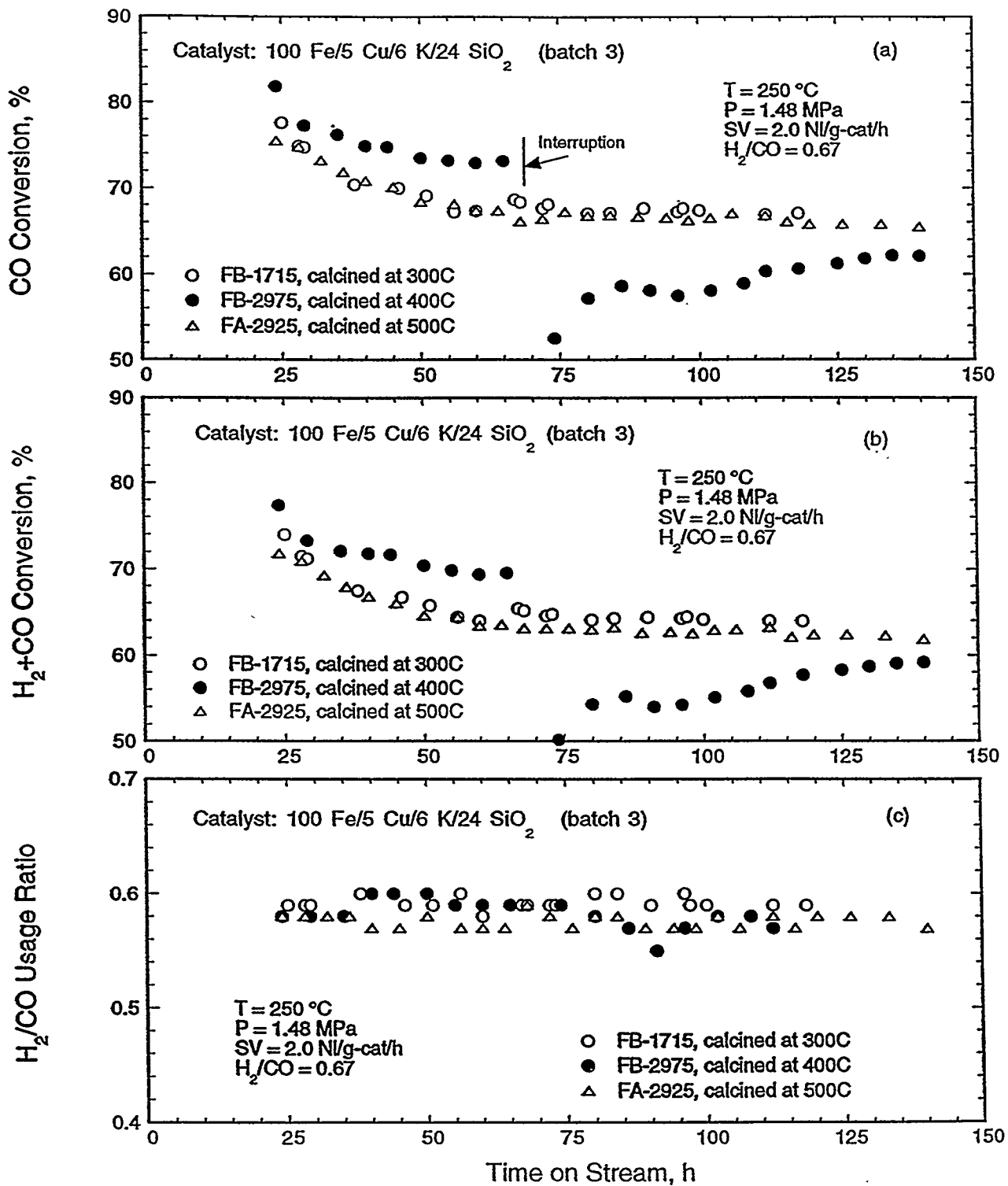


Figure 11. Effect of calcination temperature on (a) CO conversion, (b) (H₂+CO) syngas conversion, and (c) H₂/CO usage ratio in FBR tests with the 100 Fe/5 Cu/6 K/24 SiO₂ catalyst.

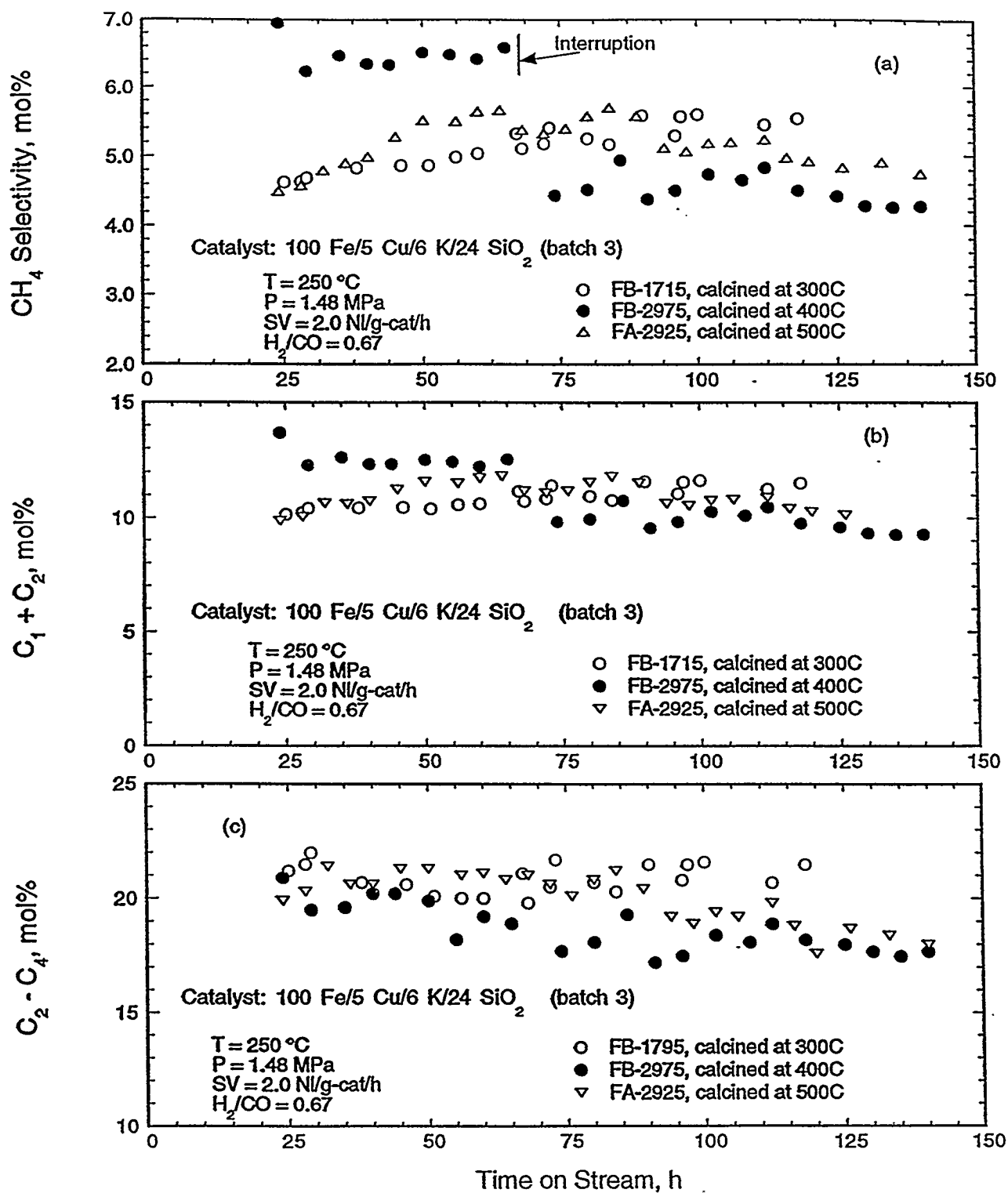


Figure 12. Effect of calcination conditions on (a) methane selectivity, (b) C₁+C₂ selectivity and (c) C₂-C₄ selectivity in FBR tests with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

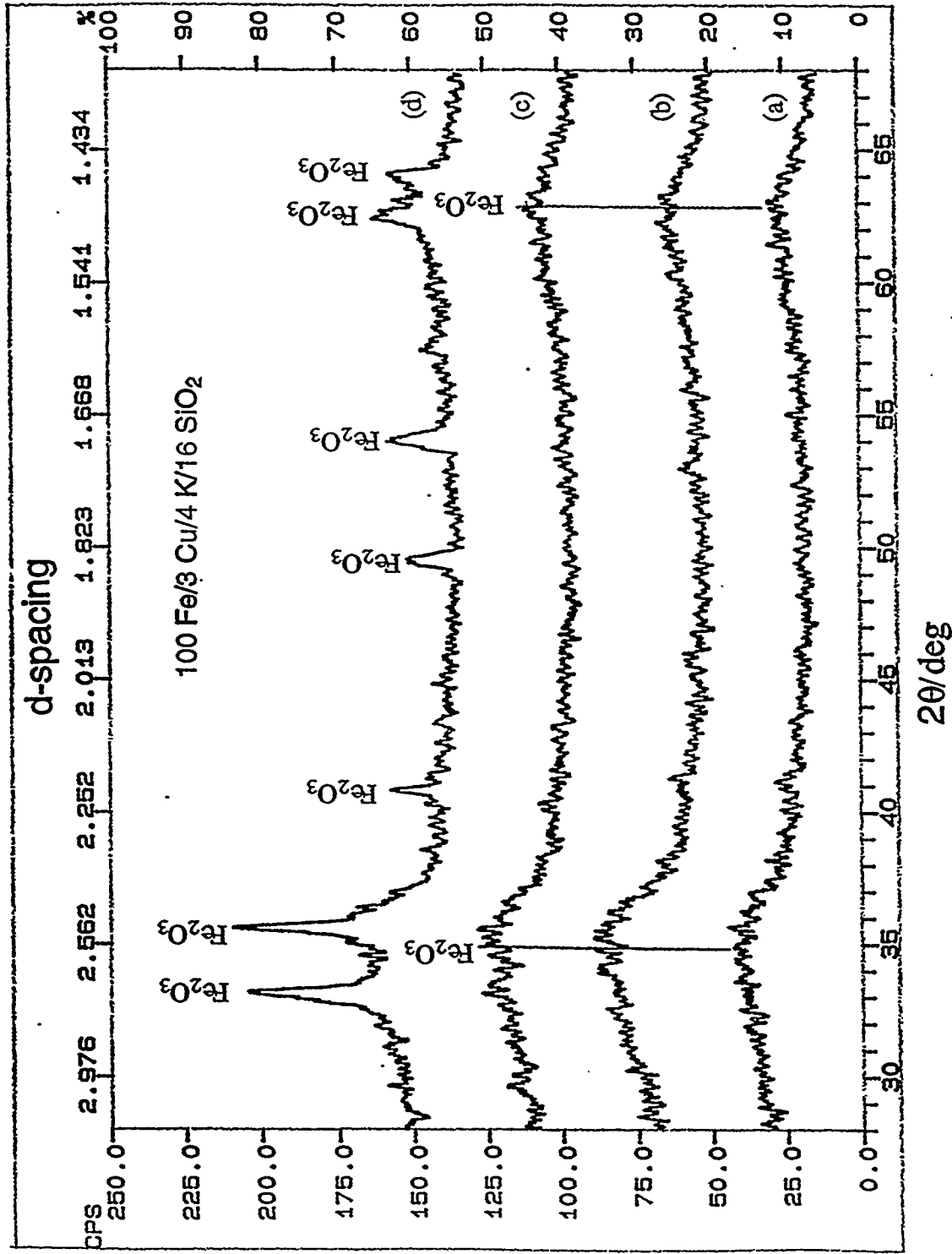
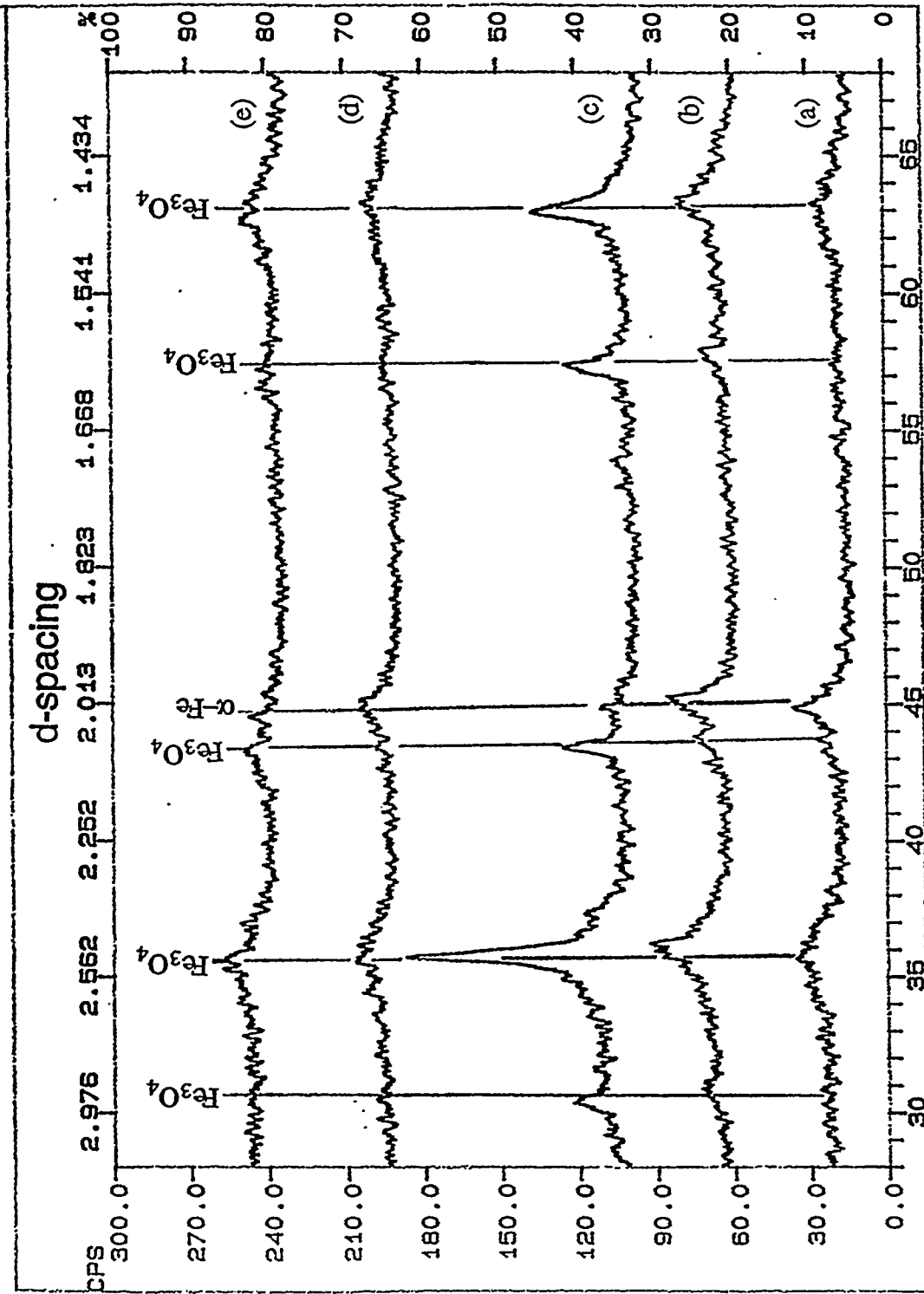


Figure 13. XRD patterns of the calcined samples of catalyst C (100 Fe/3 Cu/4 K/16 SiO₂, batch-4): (a) calcined at 300 °C for 5 h, (b) 400 °C for 5 h, (c) 500 °C for 5 h, and (d) 700 °C for 1 h.



2 θ /deg.

Figure 14. XRD patterns of the reduced catalysts (TOS=0 h) from slurry reactor tests: (a) SB-2695 (100 Fe/3 Cu/4 K/16 SiO₂, batch 2), (b) SA-2715 (100 Fe/3 Cu/4 K/16 SiO₂, batch 3), (c) SB-2145 (100 Fe/3 Cu/4 K/16 SiO₂, batch 4), (d) SA-2615 (100 Fe/5 Cu/6 K/24 SiO₂, batch 4), and (e) SB-2585 (100 Fe/5 Cu/6 K/24 SiO₂, batch 5).

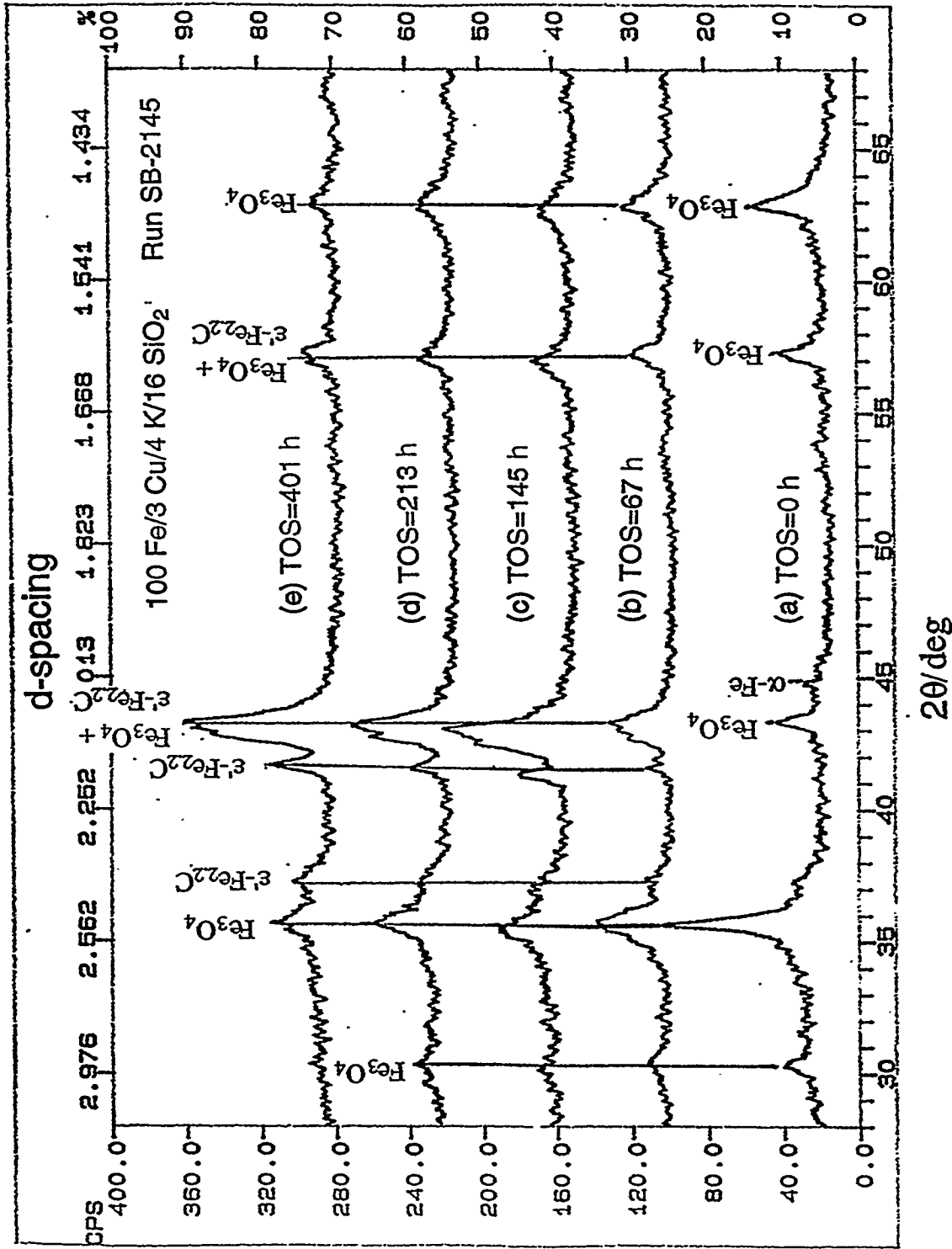


Figure 15. Change in bulk iron phases with time on stream during run SB-2145 with catalyst C (100 Fe/3 Cu/4 K/16 SiO₂, batch 4): (a) TOS=0 h; (b) TOS=67 h; (c) TOS=145 h; (d) TOS=213 h and (e) TOS=401 h.

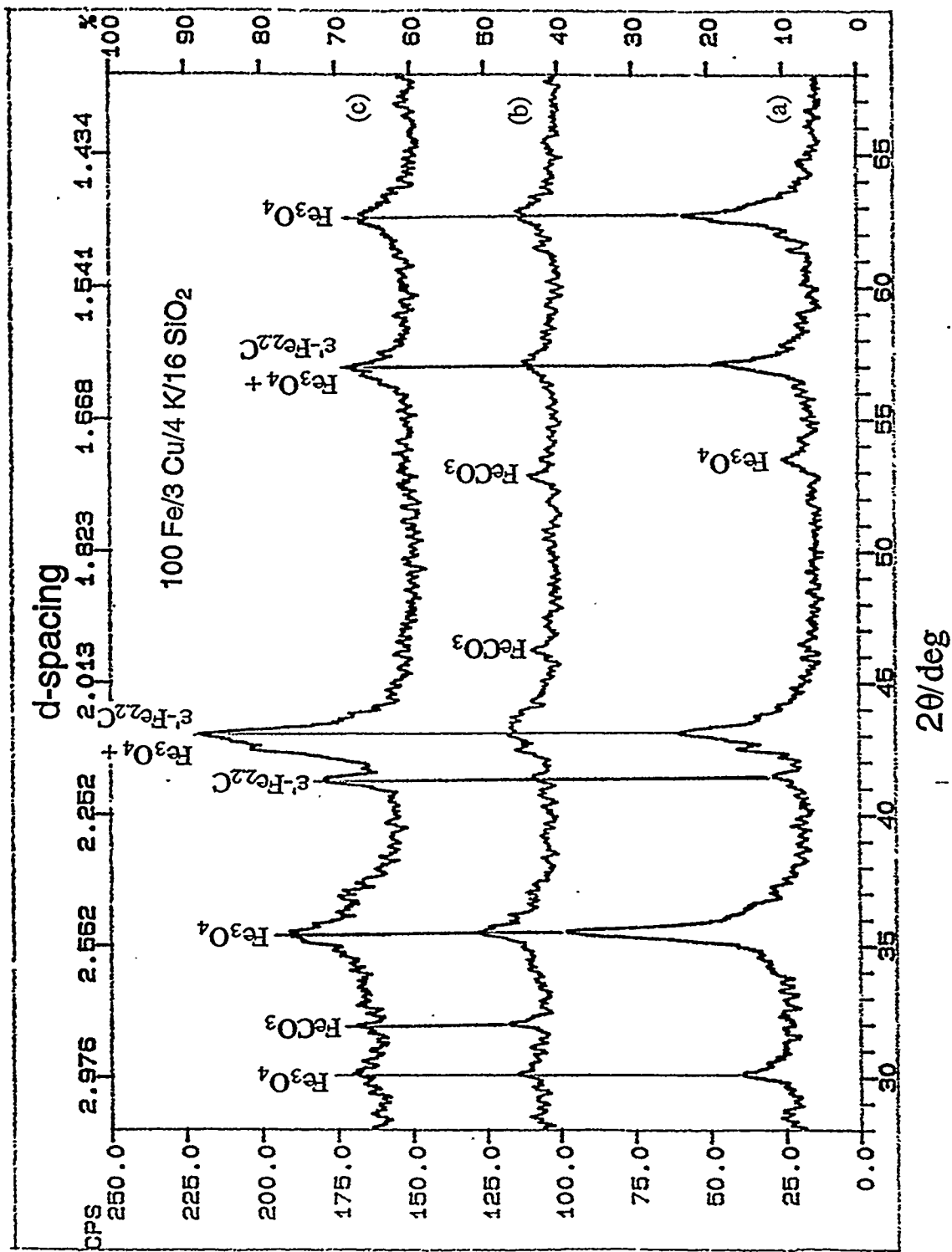


Figure 16. XRD patterns of used catalysts C (100 Fe/3 Cu/4 K/16 SiO₂) from different slurry reactor tests: (a) SB-2695 (batch 2), TOS=142 h, (b) SA-2715 (batch 3), TOS=138 h, and (c) SB-2145 (batch 4), TOS=145 h.

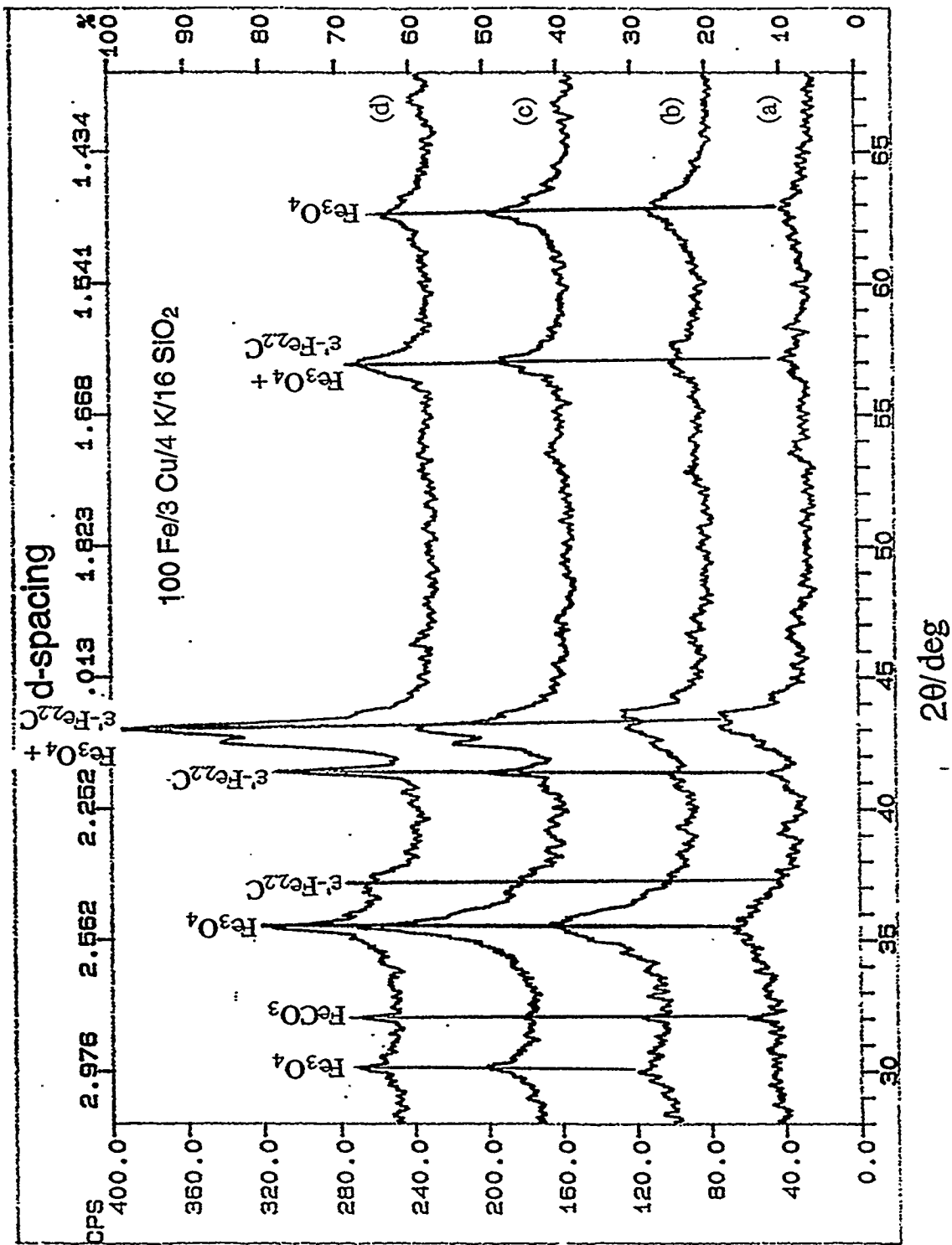


Figure 17. XRD patterns of used catalysts C (100 Fe/3 Cu/4 K/16 SiO₂) from different slurry reactor tests: (a) SB-0045 (batch 1), TOS=396 h; (b) SA-0705 (batch 1), TOS=526 h; (c) SA-1665 (batch 4), TOS=500 h; and (d) SB-2145 (batch 4), TOS=402 h.

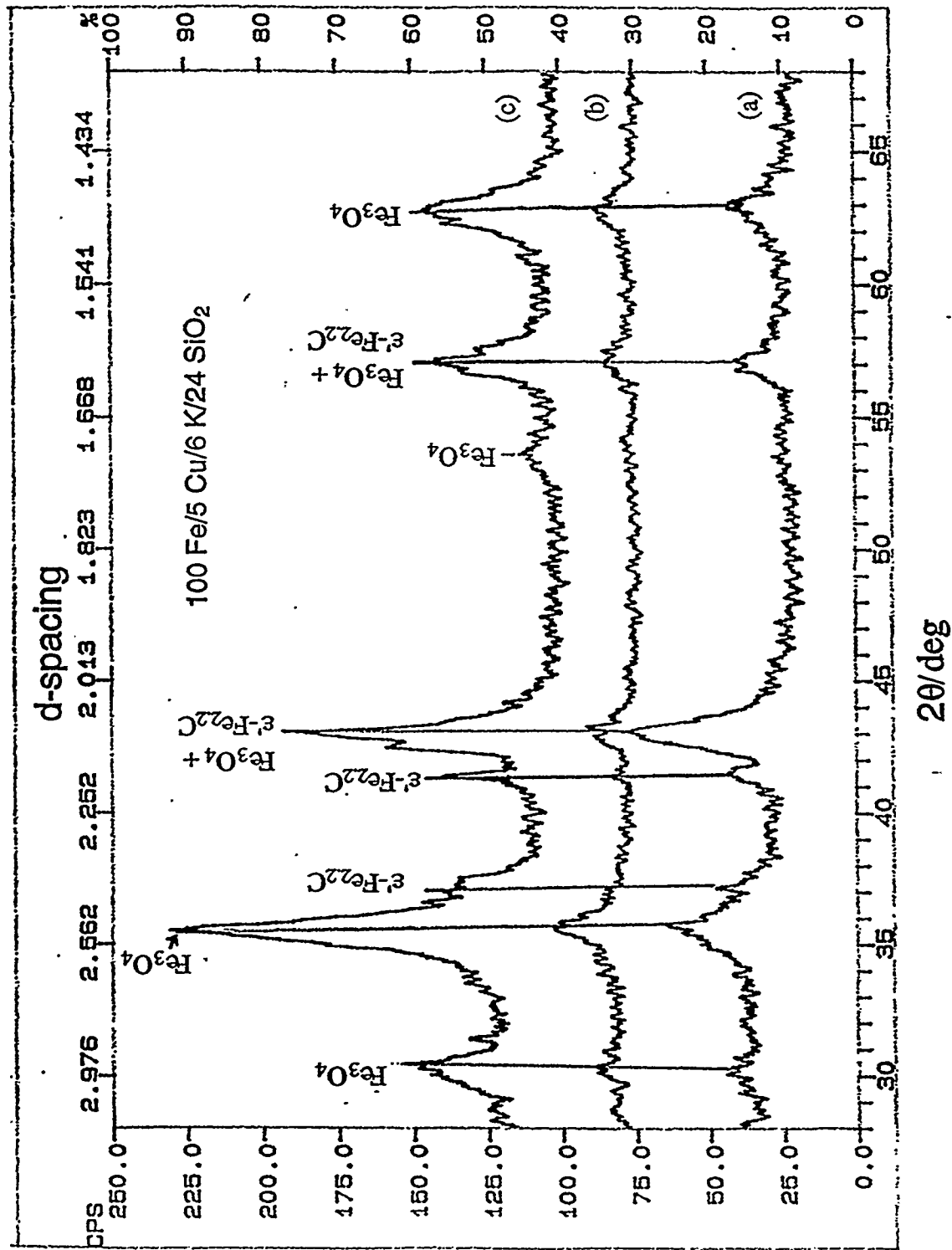


Figure 18. XRD patterns of used catalysts B (100 Fe/5 Cu/6 K/24 SiO₂) from different slurry reactor tests: (a) SB-2585 (batch 5), TOS=120 h; (b) SA-2615 (batch 4), TOS=119 h; and (c) SB-1295 (batch 3), TOS=353 h.

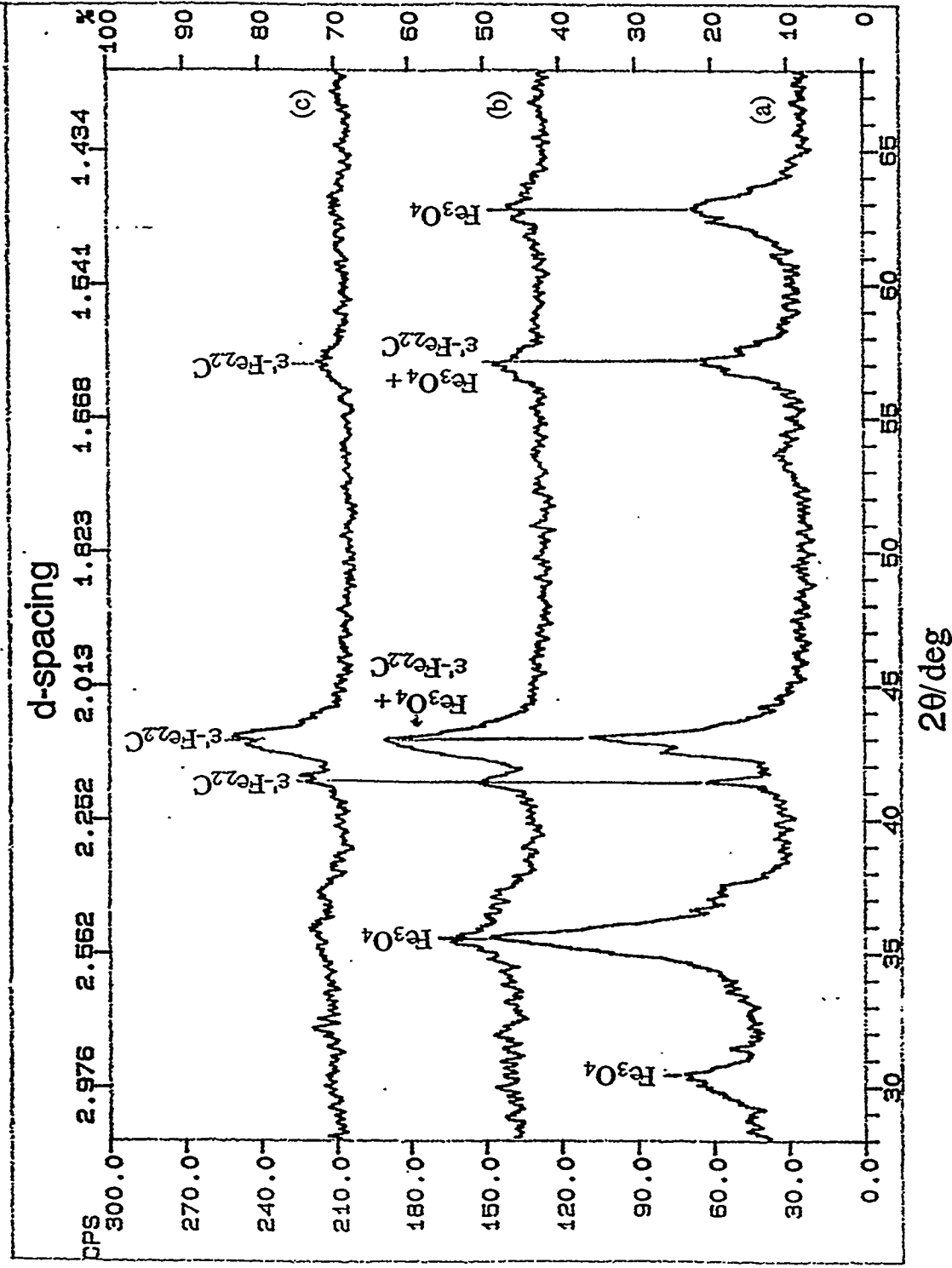


Figure 19. XRD patterns of used catalyst samples from slurry reactor tests: (a) SB-1295 (100 Fe/5 Cu/6 K/24 SiO₂, K from KHCO₃), TOS=353 h; (b) SA-2405 (100 Fe/5 Cu/5 K/24 SiO₂) TOS=550 h; and (c) SA-3155 (100 Fe/5 Cu/6 K/24 SiO₂, K from K₂SiO₃), TOS=400 h.

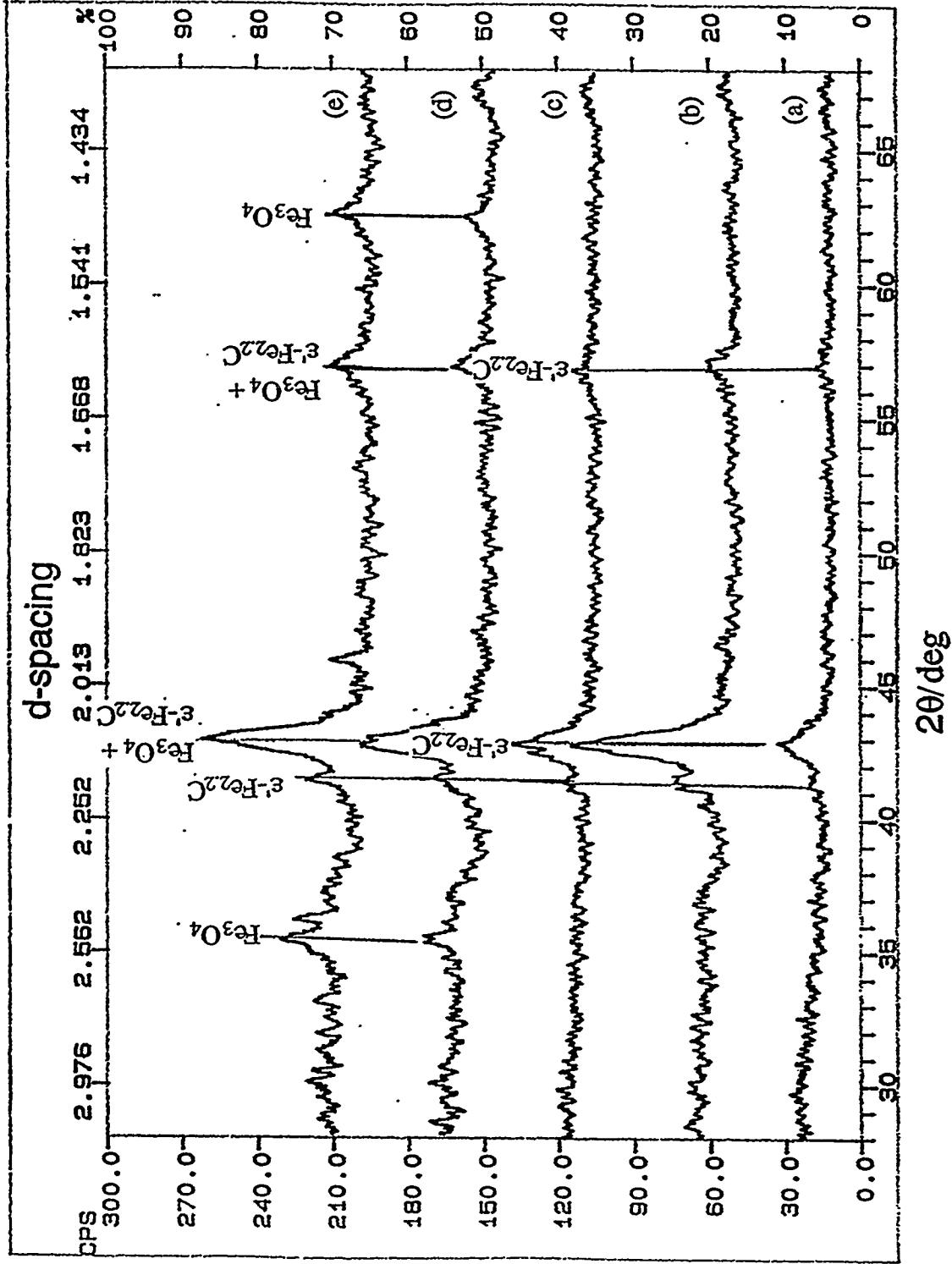


Figure 20. XRD patterns of used catalysts from fixed bed reactor tests for CaO promotion research: (a) FA-1605 (100 Fe/3 Cu/4 K/16 SiO₂), top, TOS=120 h; (b) FA-1605, bottom; (c) FB-1525 (100 Fe/3 Cu/4 K/2 Ca/16 SiO₂), mixed, TOS=120 h; (d) FB-1515 (100 Fe/3 Cu/4 K/6 Ca/16 SiO₂), top, TOS=140 h; and (e) FB-1515, bottom.

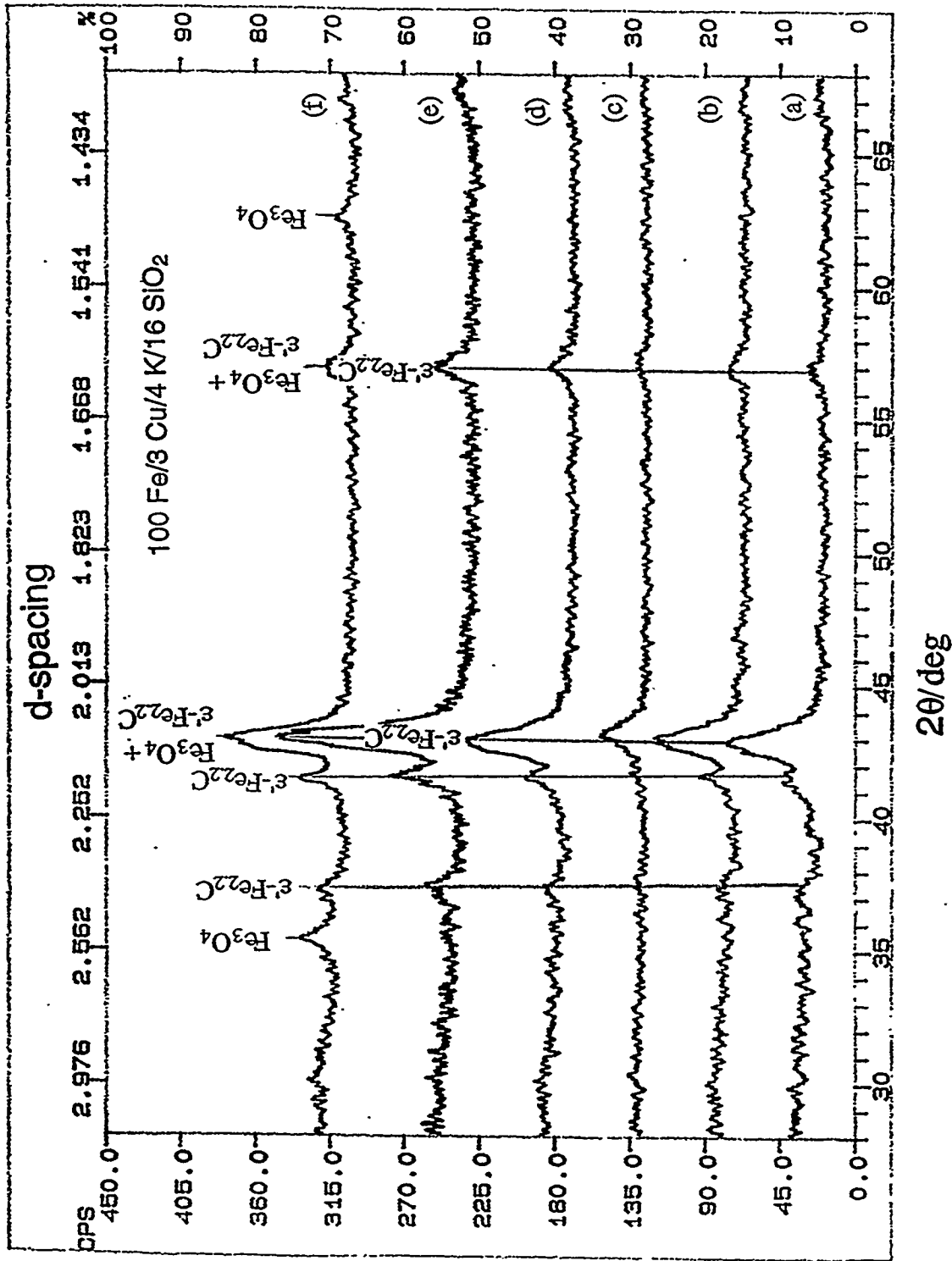


Figure 21. XRD Patterns of used catalyst (100 Fe/3 Cu/4 K/16 SiO₂, batch 4) from fixed bed reactor tests for calcination research: (a) FA-3305 (calcined at 400°C for 5 h), top, TOS=120 h; (b) FA-3305, bottom; (c) FA-3095 (calcined at 500°C for 5 h), top, TOS=120 h; (d) FA-3095, bottom; (e) FA-3495 (calcined at 700°C for 1 h), top, TOS=116 h; and (f) FA-3495, bottom.