

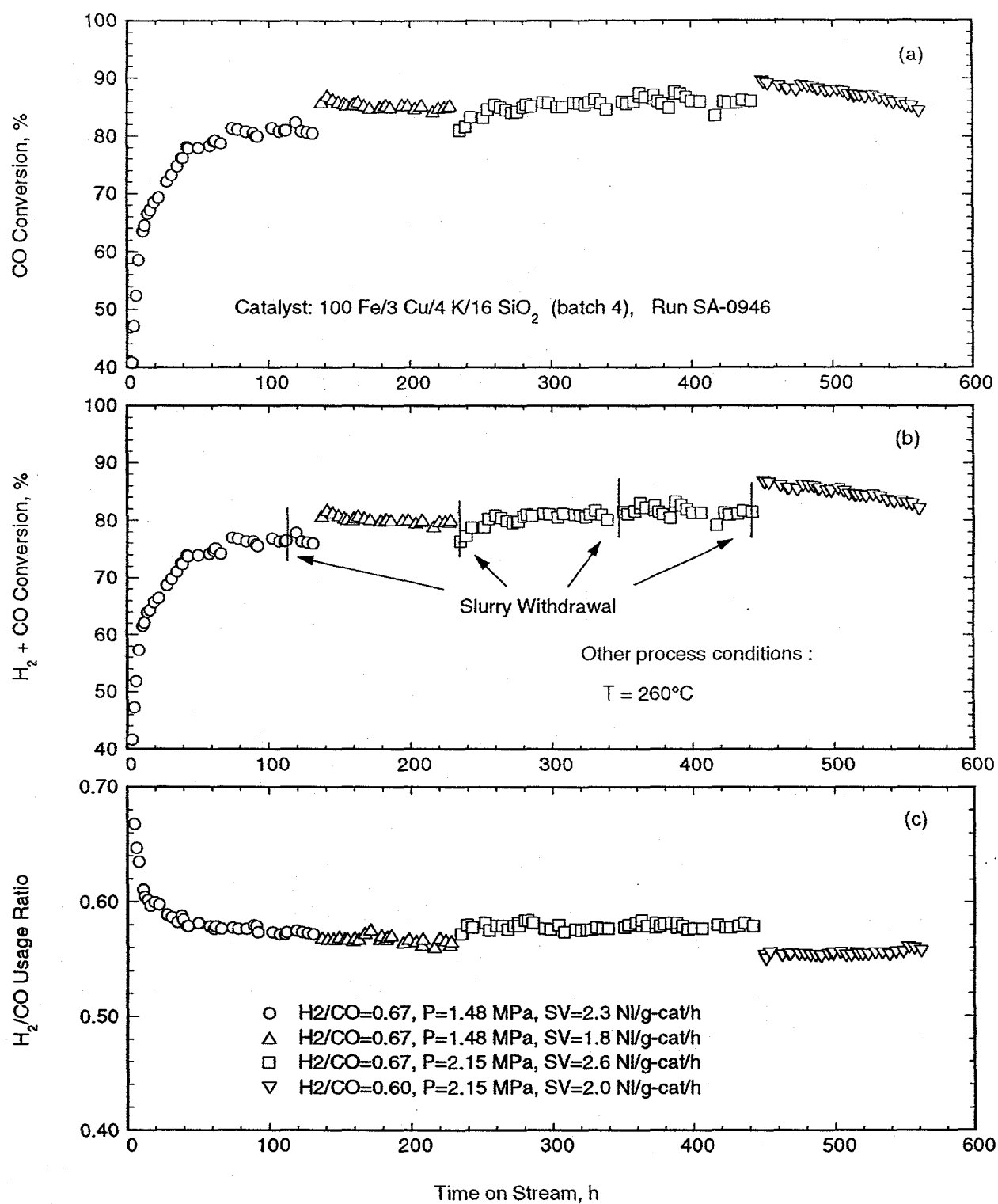


Figure 1. Change in (a) CO conversion, (b) (H₂+CO) conversion, and (c) H₂/CO usage ratio with time on stream in run SA-0946 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

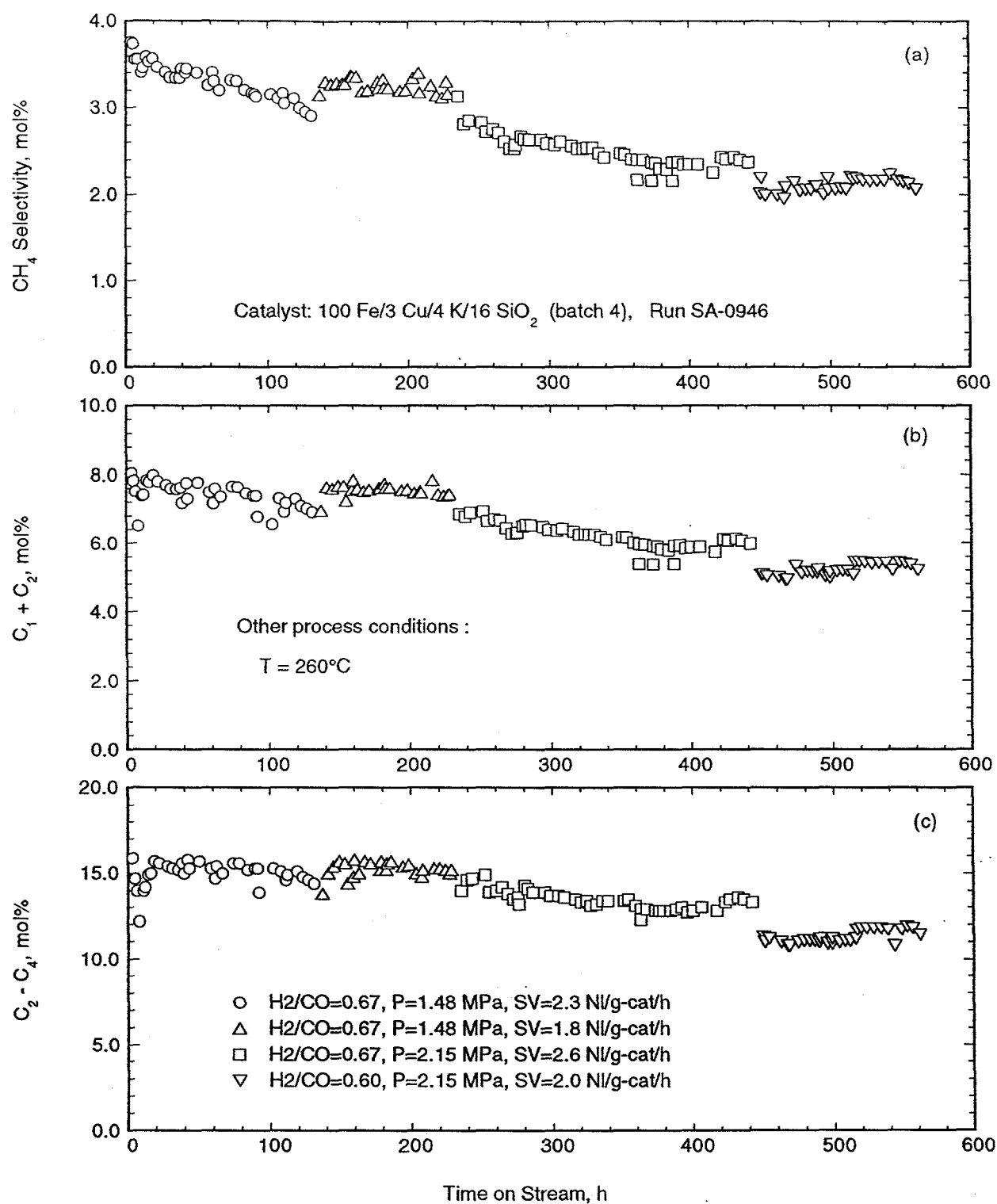


Figure 2. Change in (a) methane selectivity, (b) C₁+C₂ selectivity and (c) C₂-C₄ selectivity with time on stream in run SA-0946 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

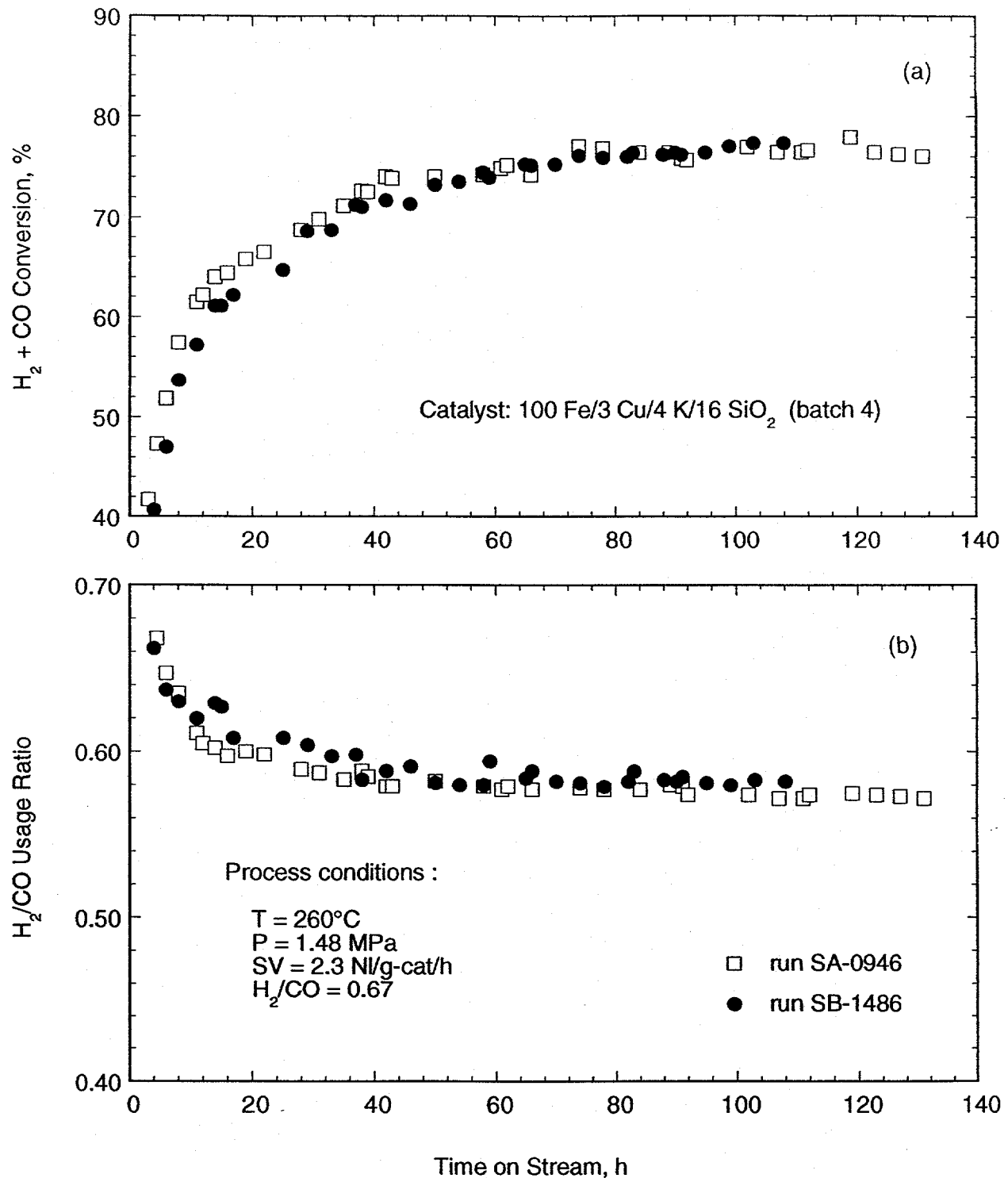


Figure 3. Comparison of (a) (H_2+CO) conversion and (b) H_2/CO usage ratio between runs SA-0946 and SB-1486 with the 100 Fe/3 Cu/4 K/16 SiO_2 catalyst after pretreatment with CO.

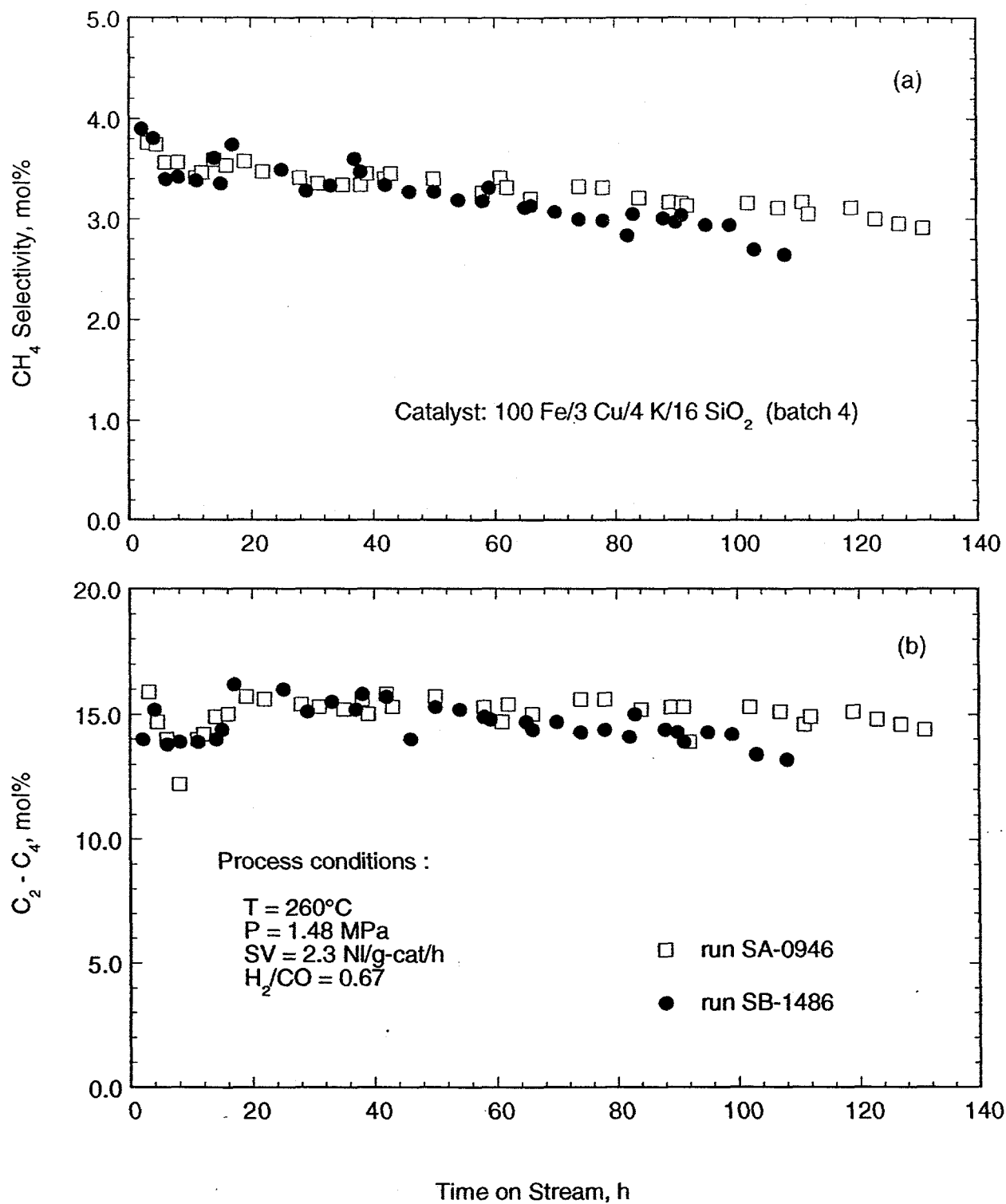


Figure 4. Comparison of (a) methane and (b) C₂-C₄ selectivity between runs SA-0946 and SB-1486 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst after pretreatment with CO.

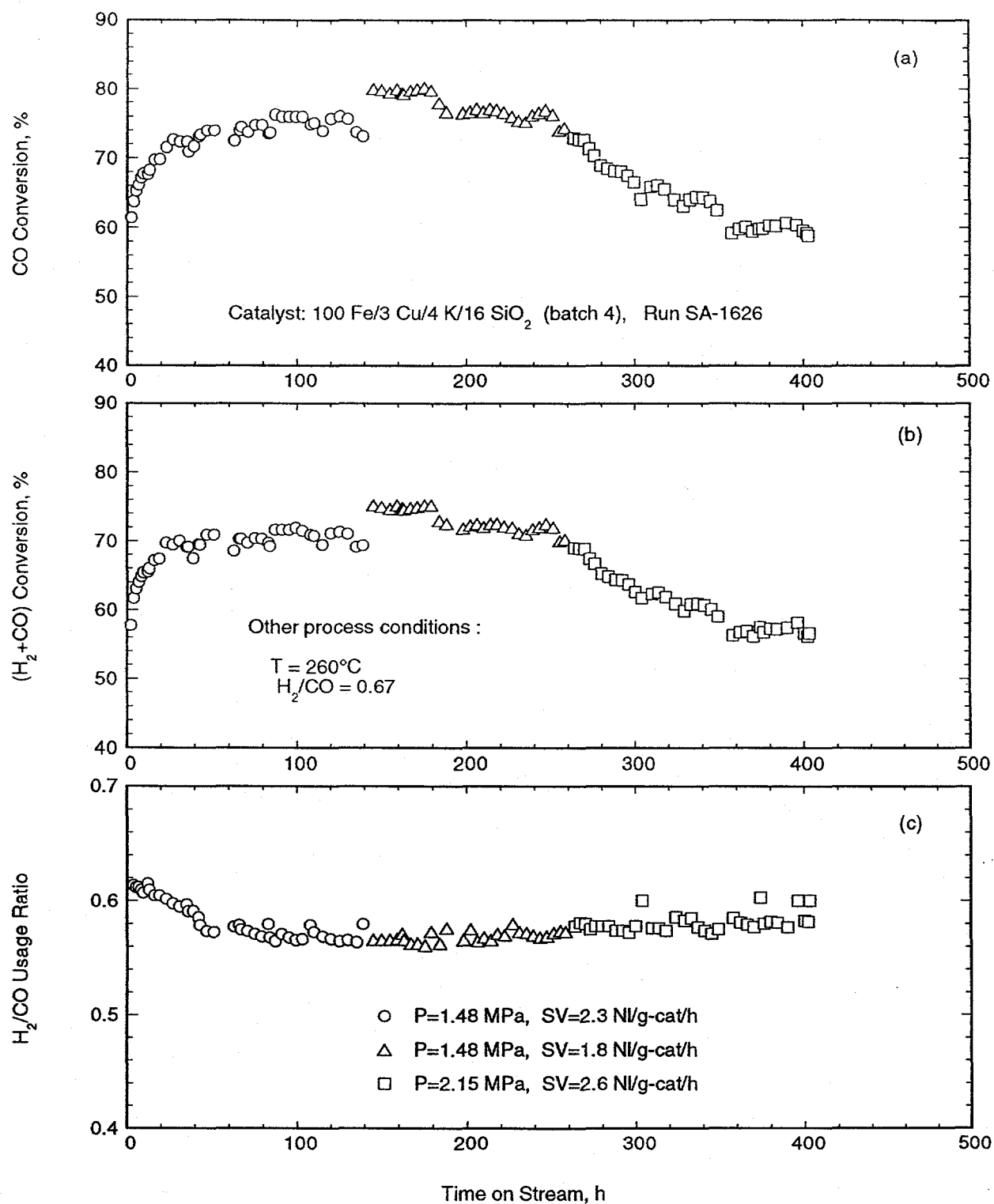


Figure 5. Change in (a) CO conversion, (b) (H₂+CO) conversion, and (c) H₂/CO usage ratio with time on stream in run SA-1626 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

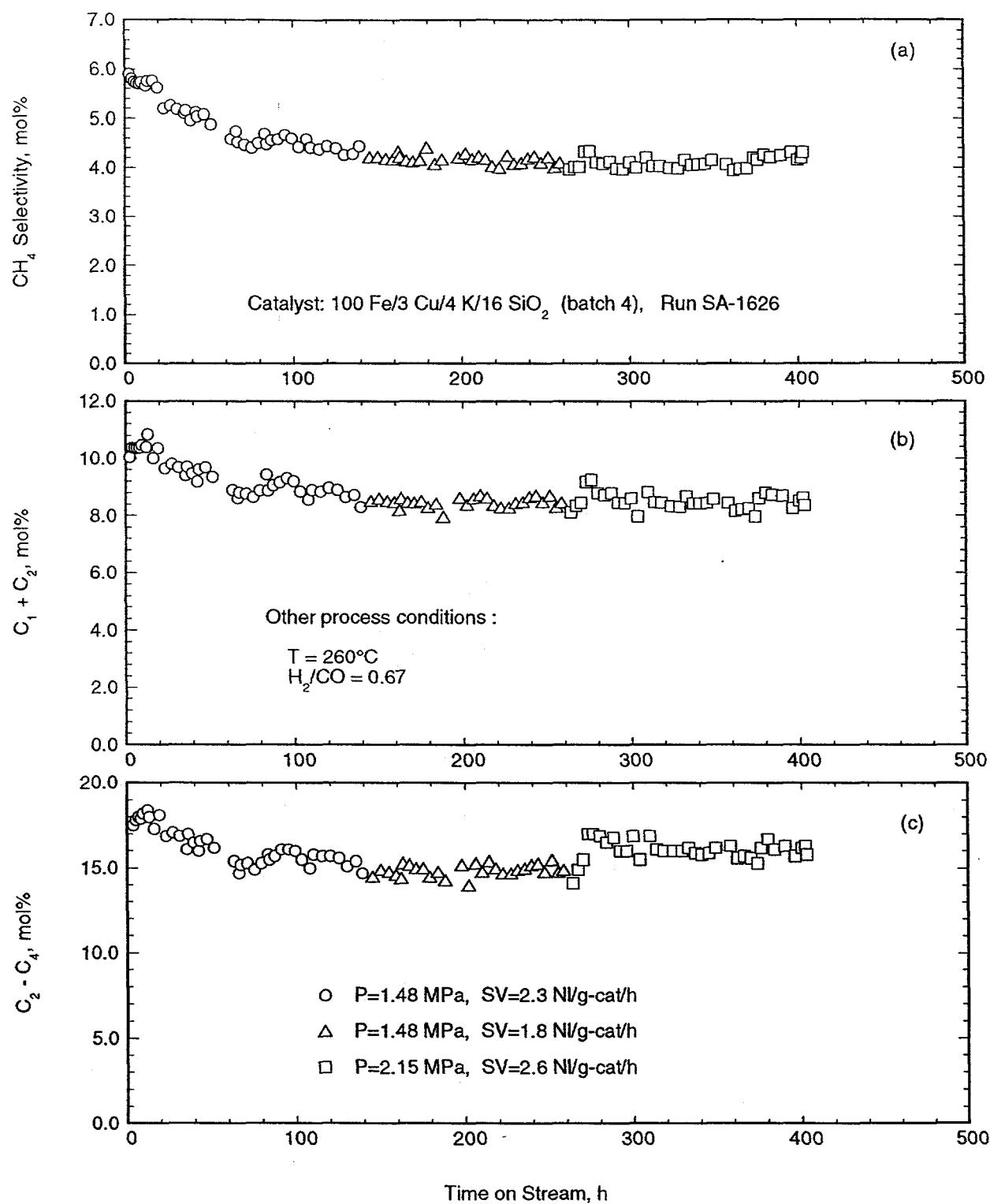


Figure 6. Change in (a) methane selectivity, (b) C₁+C₂ selectivity and (c) C₂-C₄ selectivity with time on stream in run SA-3155 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

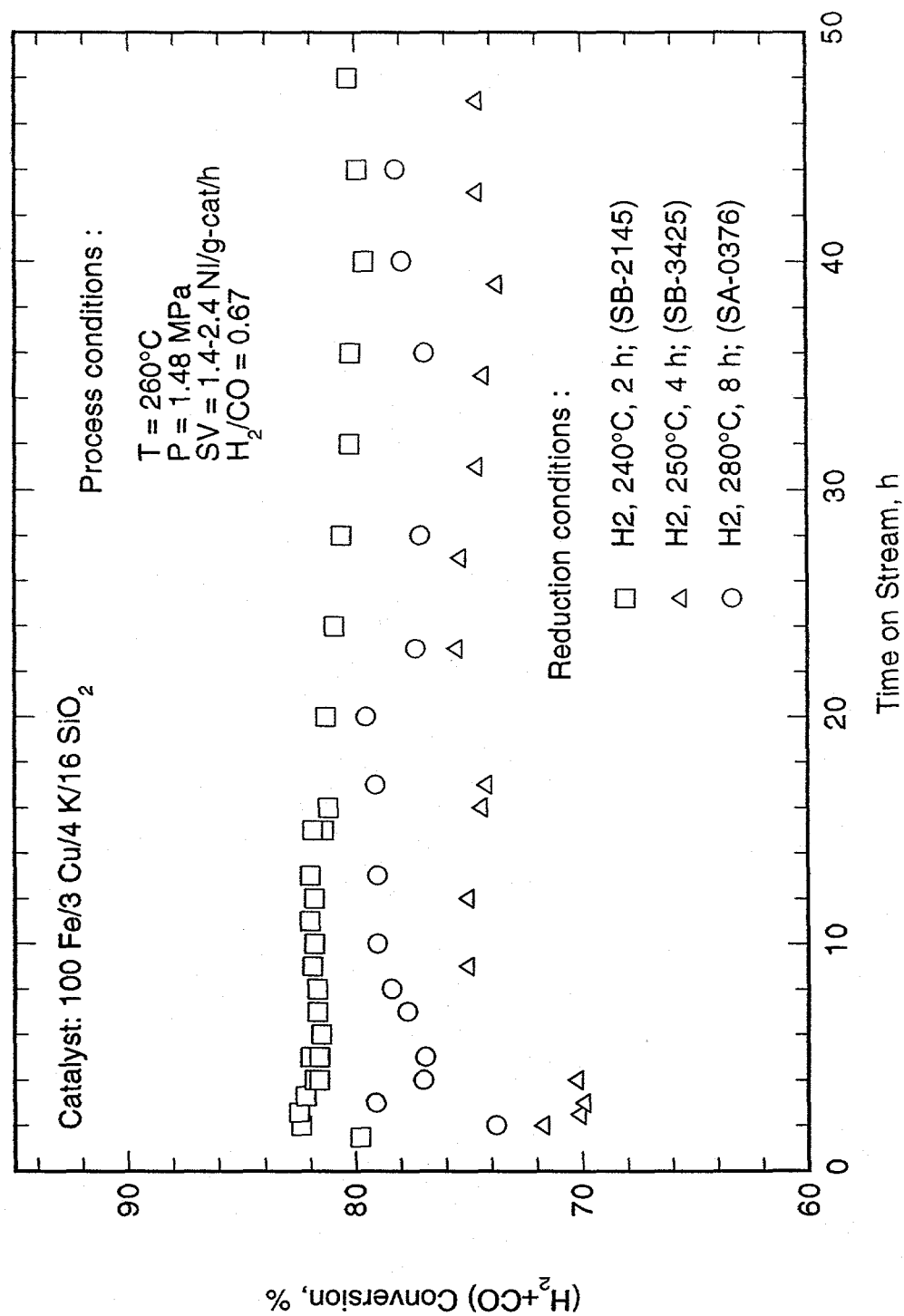


Figure 7. Comparison of (H₂+CO) conversion among STSR runs SB-2145, SB-3425 and SA-0376 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst after pretreatment with H₂ at different conditions.

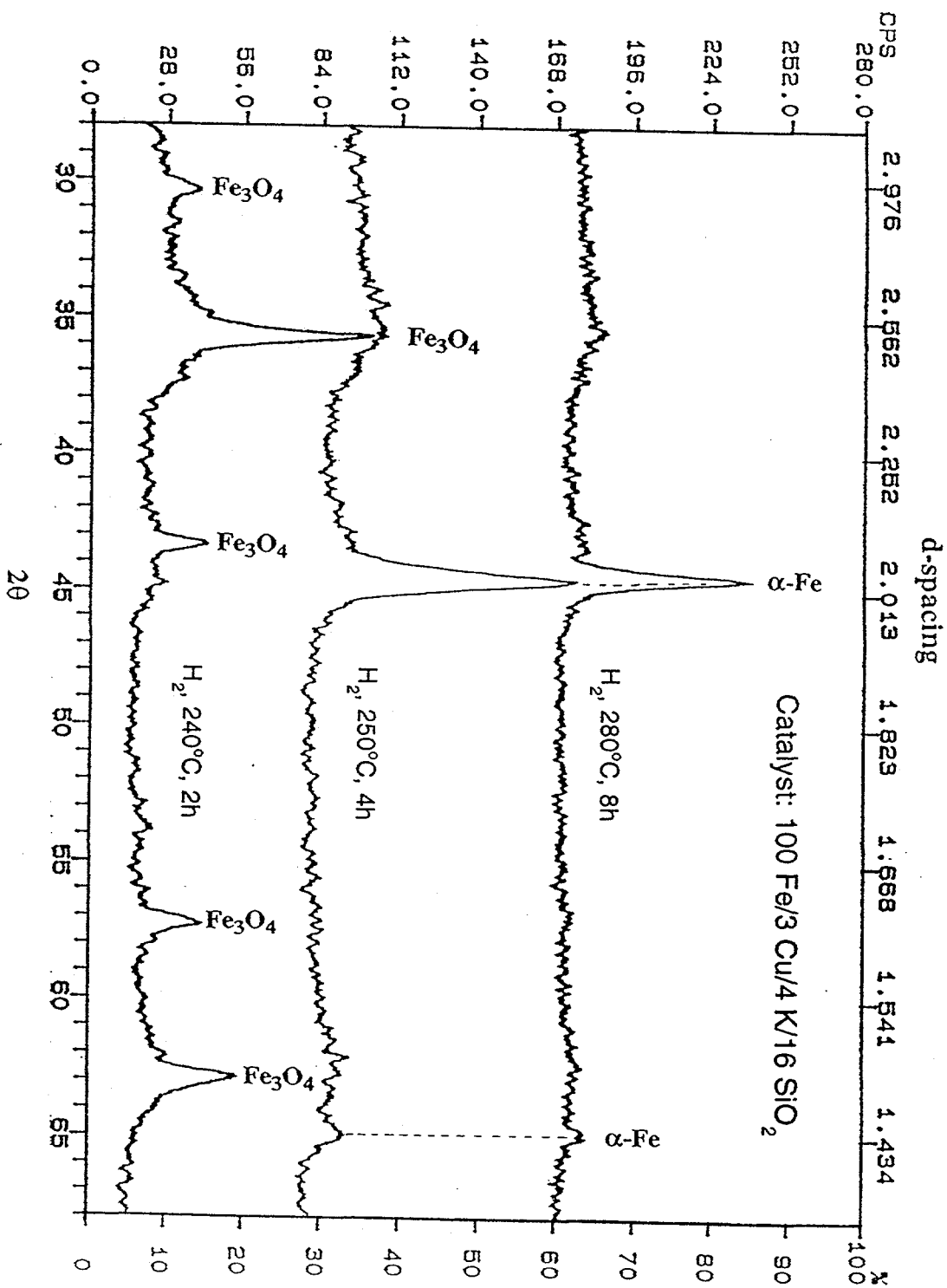


Figure 8. XRD patterns of the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst after pretreatment with H₂ at different conditions.

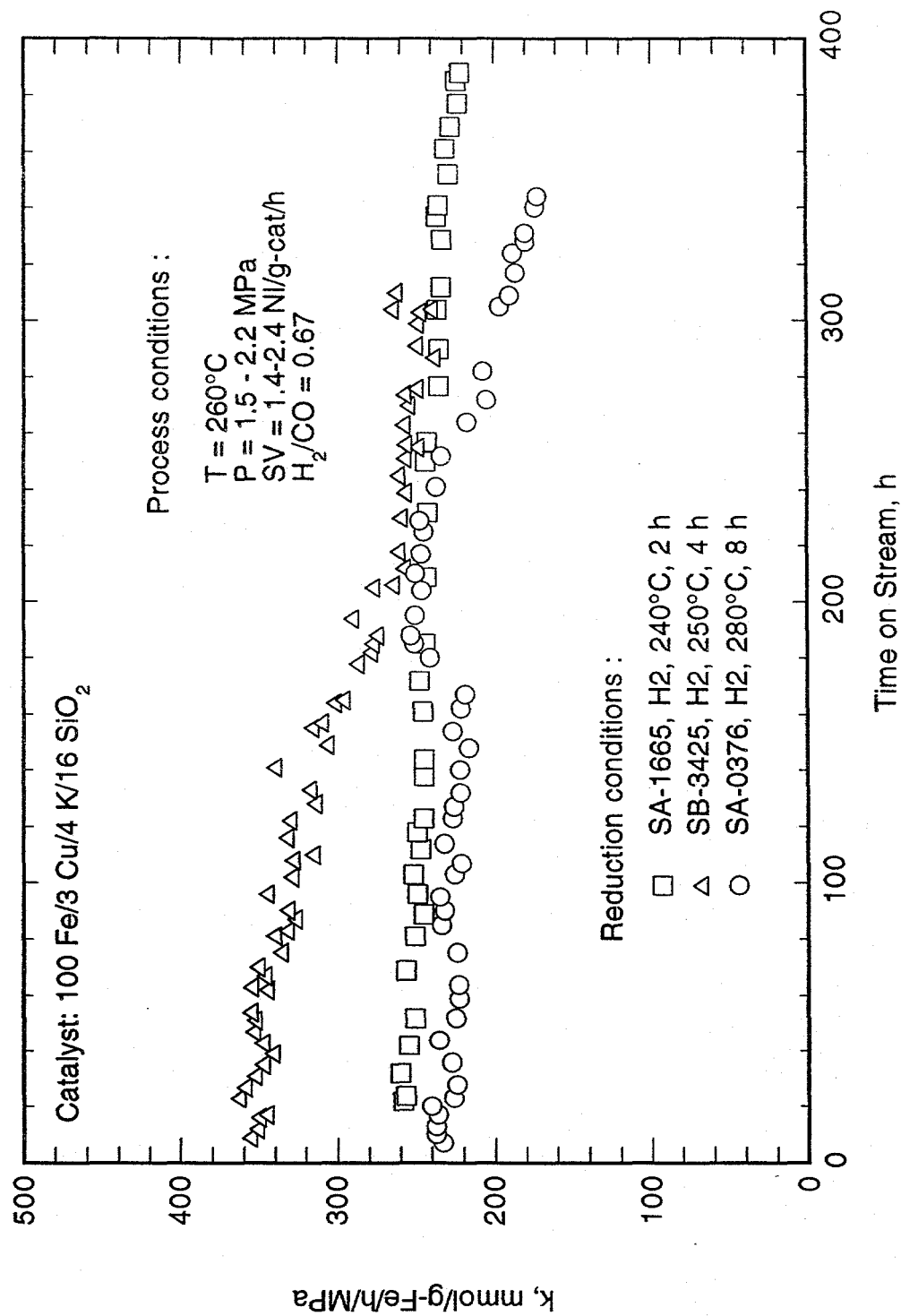


Figure 9. Comparison of apparent first order reaction rate constant among STSR tests SB-2145, SB-3425 and SA-0376 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst after pretreatment with H₂ at different conditions.

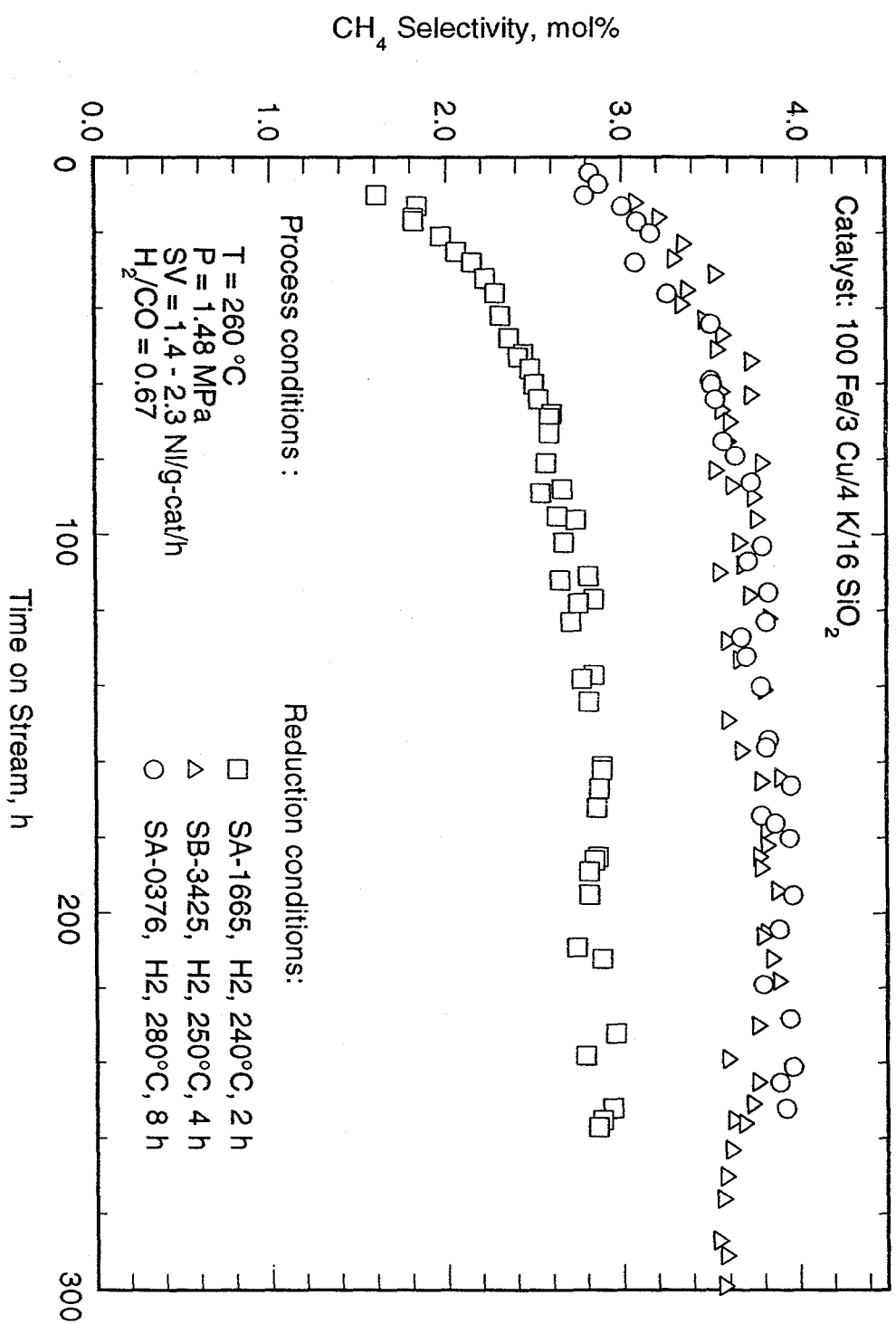


Figure 10. Comparison of methane selectivity among STSR tests SB-2145, SB-3425 and SA-0376 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst after pretreatment with H₂ at different conditions.

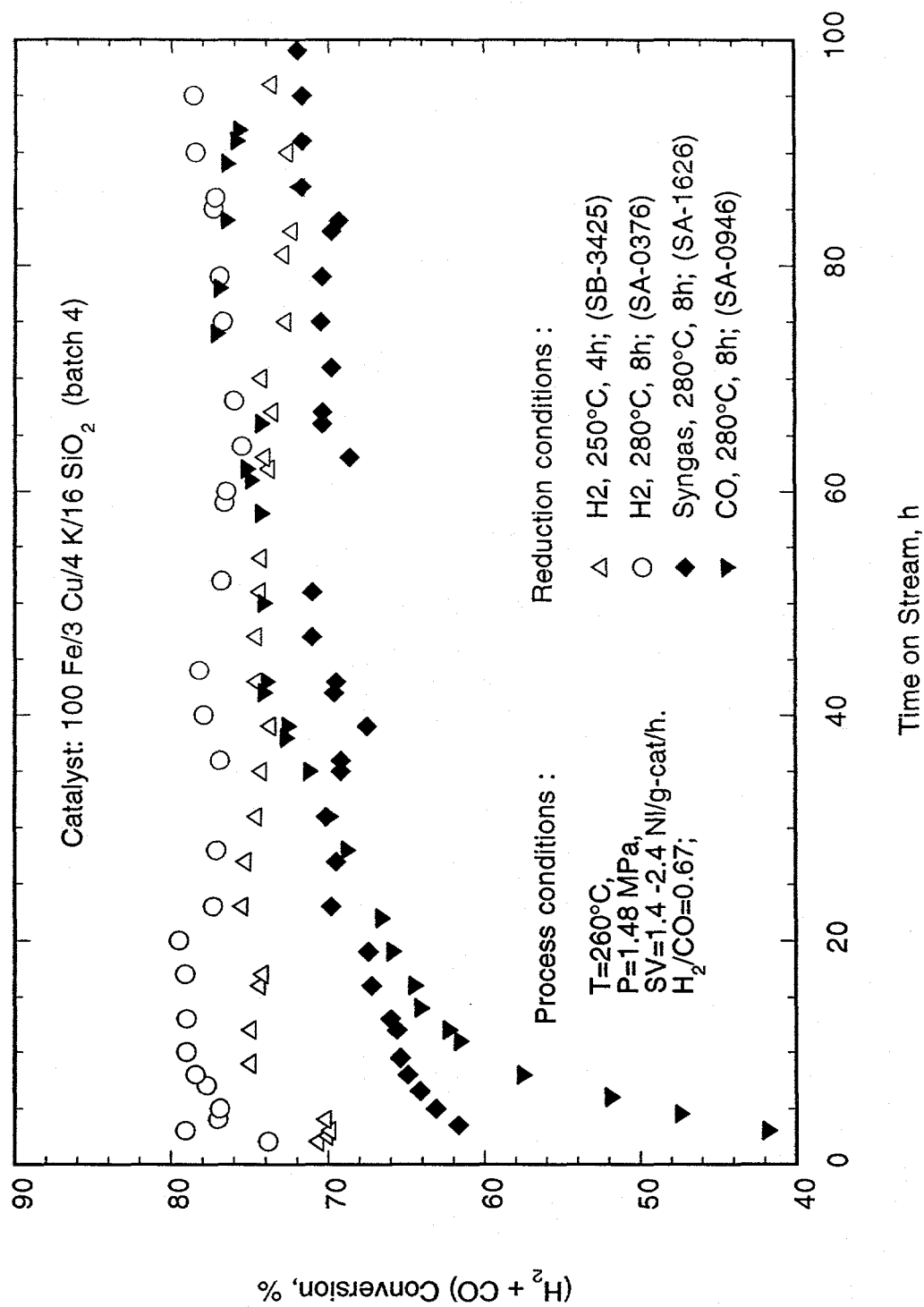


Figure 11. Effect of reductant on (H₂+CO) conversion in STSR tests SB-3425, SA-0376, SA-1626 and SA-0946 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

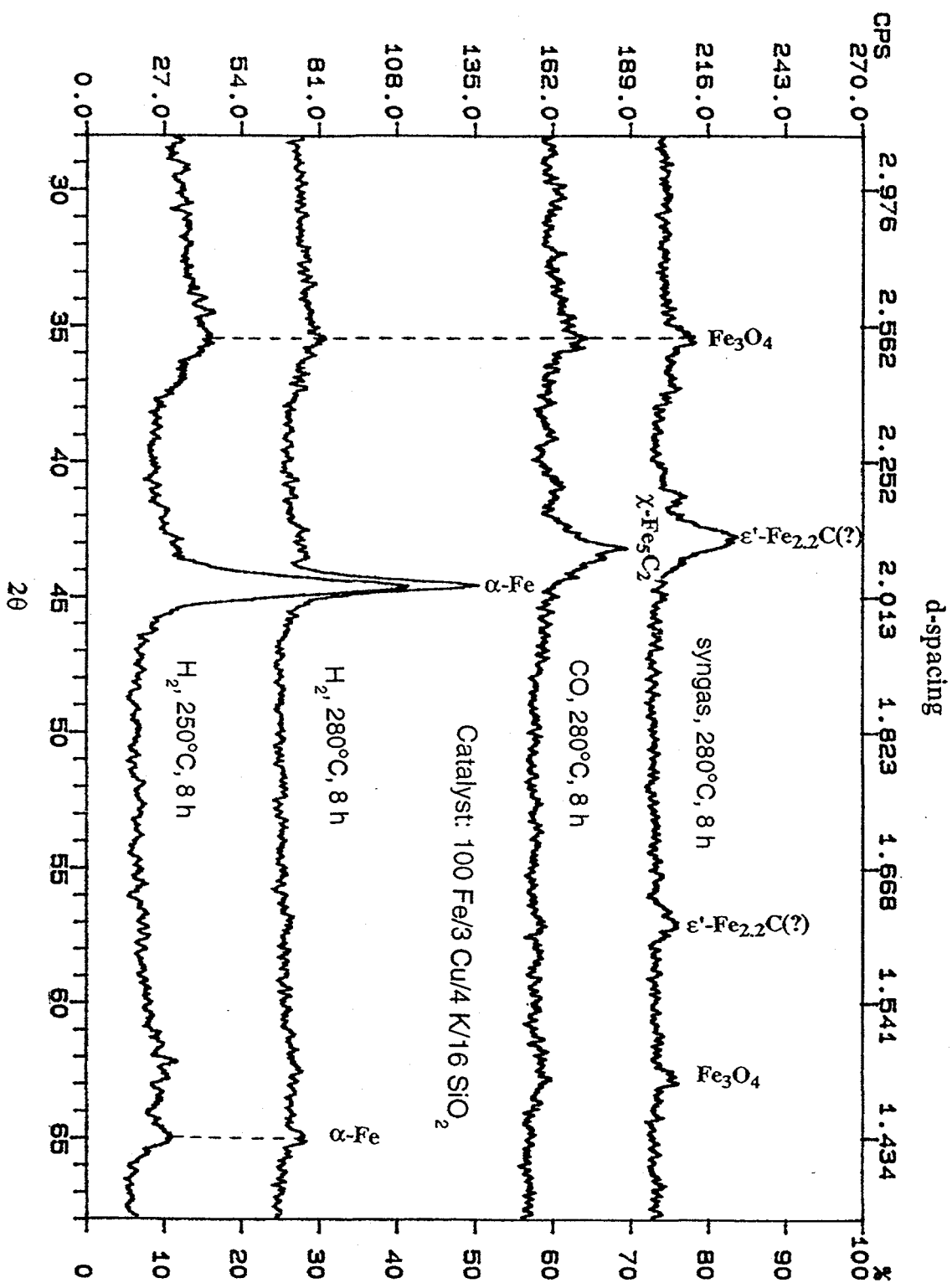


Figure 12. XRD patterns of the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst after different pretreatments.

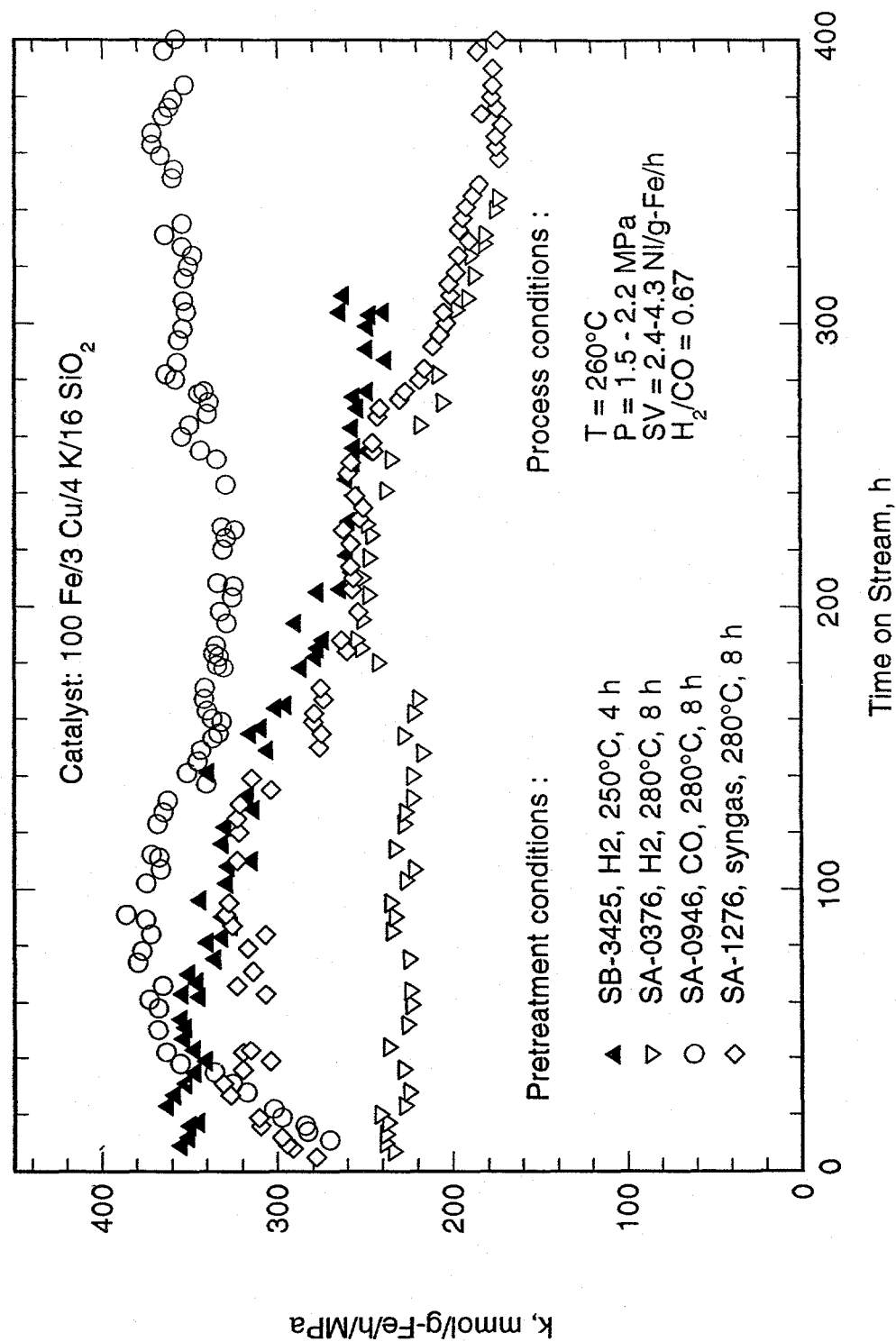


Figure 13. Effect of reductant on apparent first order reaction rate constant in STSR tests SB-3425, SA-0376, SA-1626 and SA-0946 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

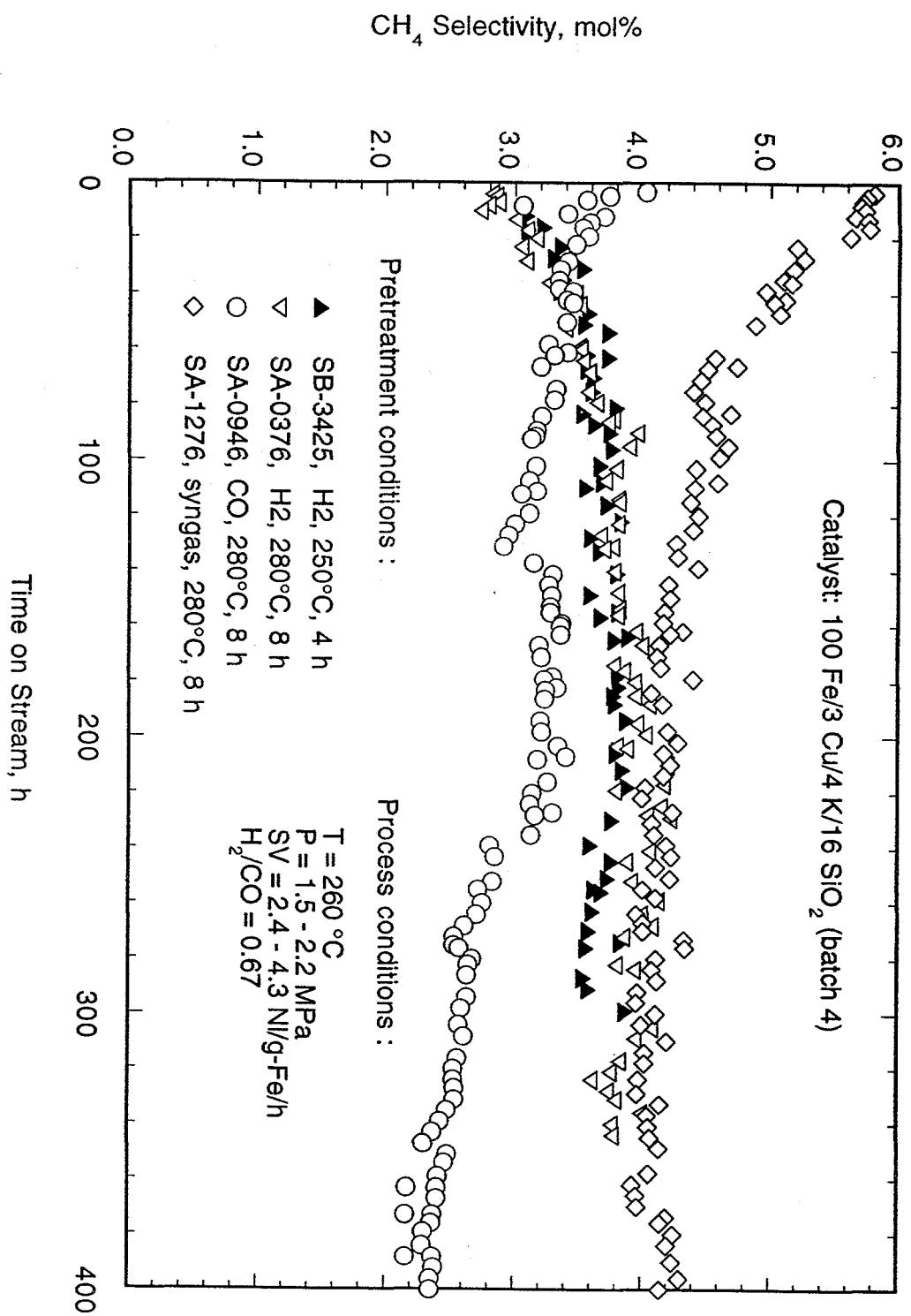


Figure 14. Effect of reductant on methane selectivity in STSR tests SB-3425, SA-0376, SA-1626 and SA-0946 with the 100 Fe/3 Cu/4 K/16 SiO₂ catalyst.

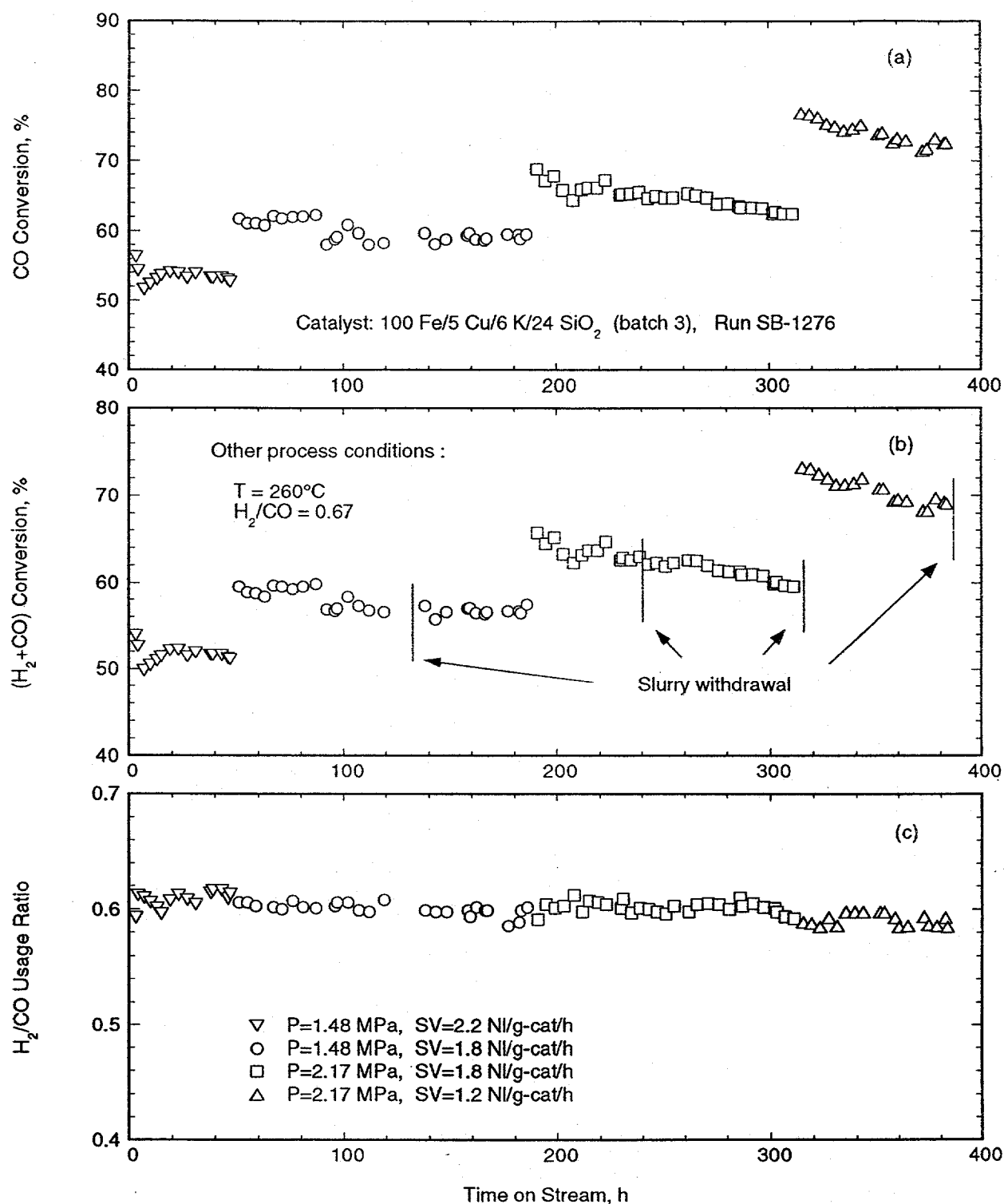


Figure 15. Change in (a) CO conversion, (b) (H₂+CO) conversion, and (c) H₂/CO usage ratio with time on stream in run SB-1276 with the 100 Fe/5 Cu/6 K/24 SiO₂ catalyst calcined at 700°C.

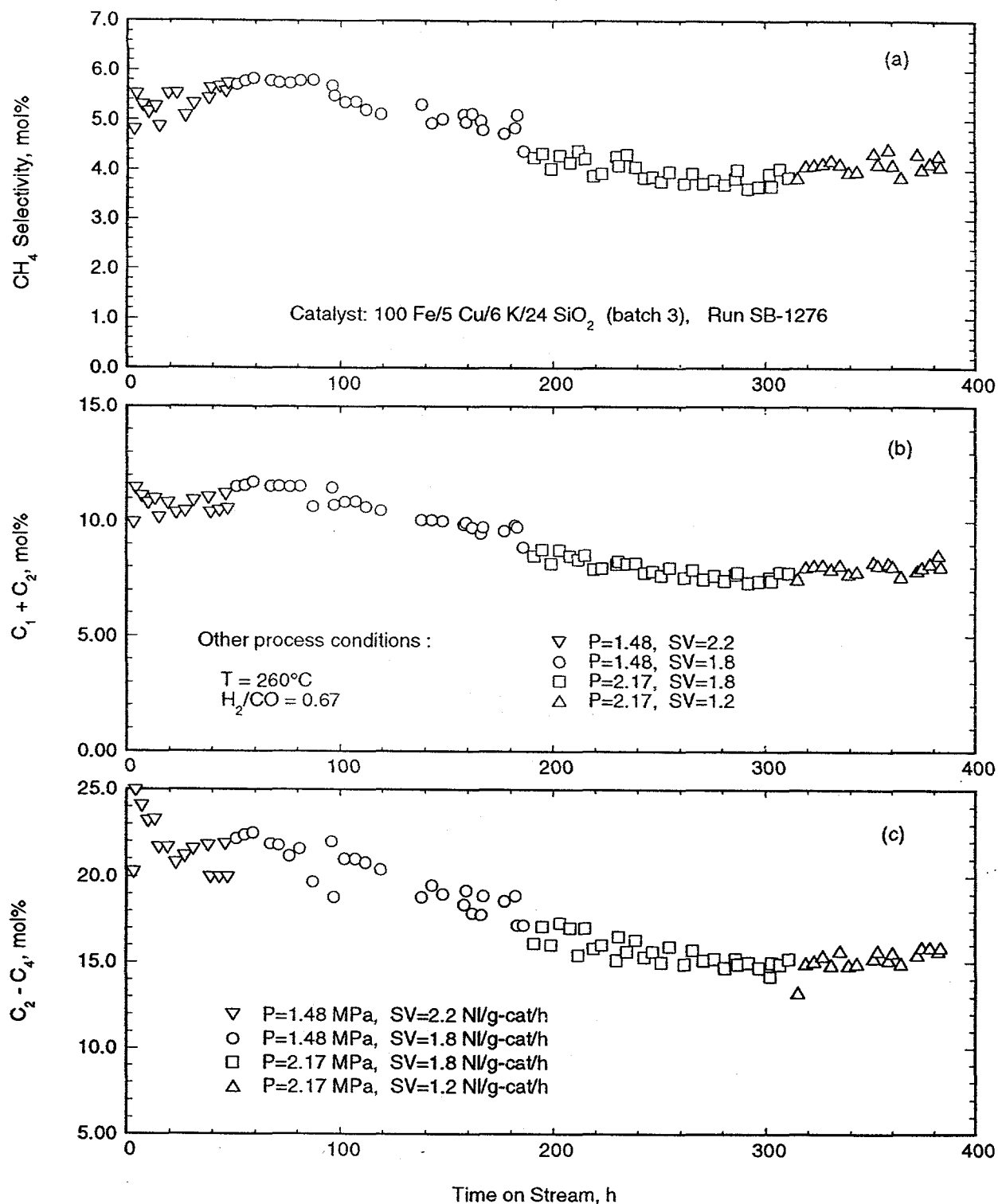


Figure 16. Change in (a) methane selectivity, (b) C₁+C₂ selectivity and (c) C₂-C₄ selectivity with time on stream in run SB-1276 with the 100 Fe/5 Cu/6 K/24 SiO₂ catalyst calcined at 700°C.

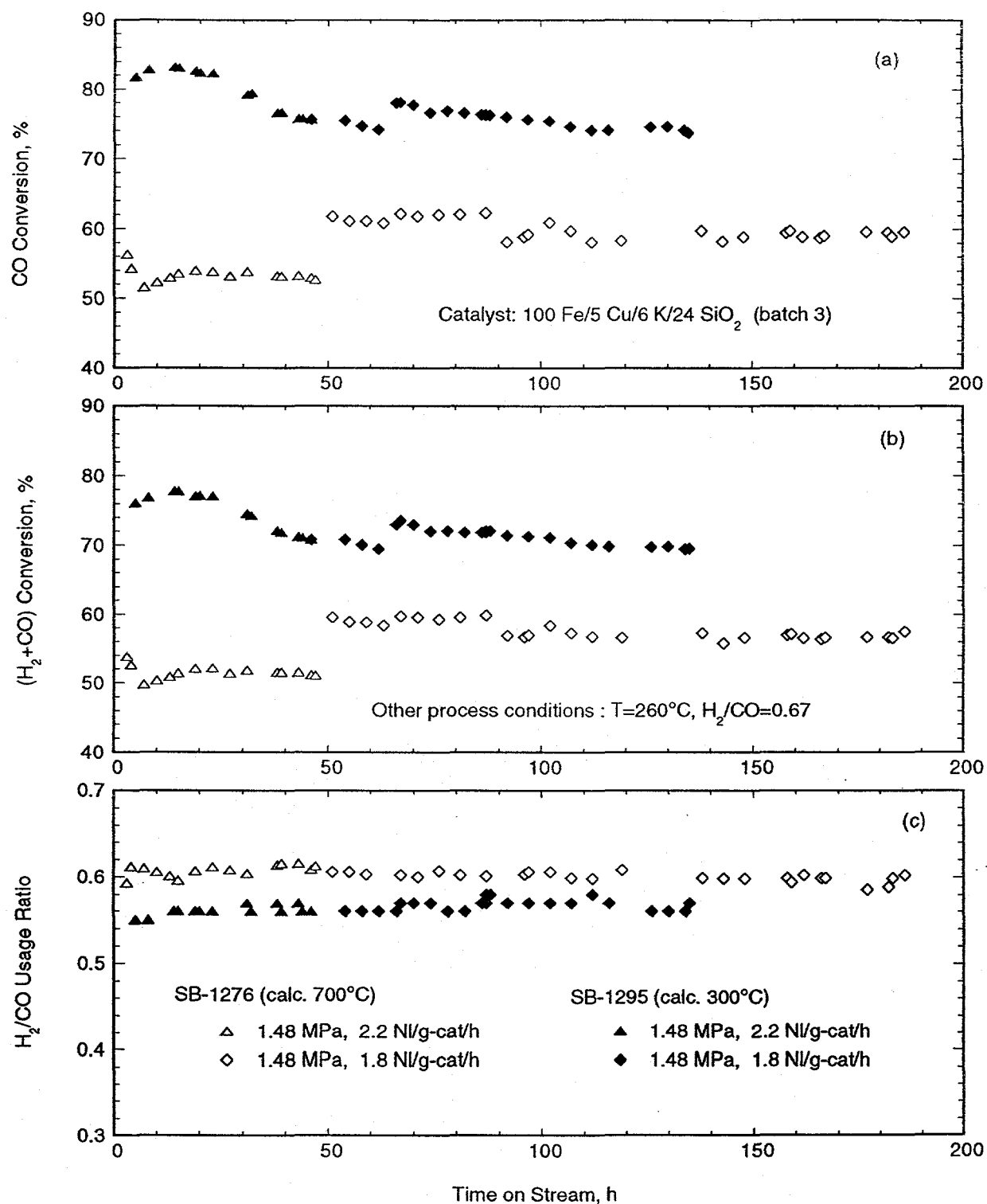


Figure 17. Effect of calcination conditions on (a) CO conversion, (b) (H₂+CO) conversion, and (c) H₂/CO usage ratio in STSR tests with the 100 Fe/5 Cu/6 K/24 SiO₂ catalyst.

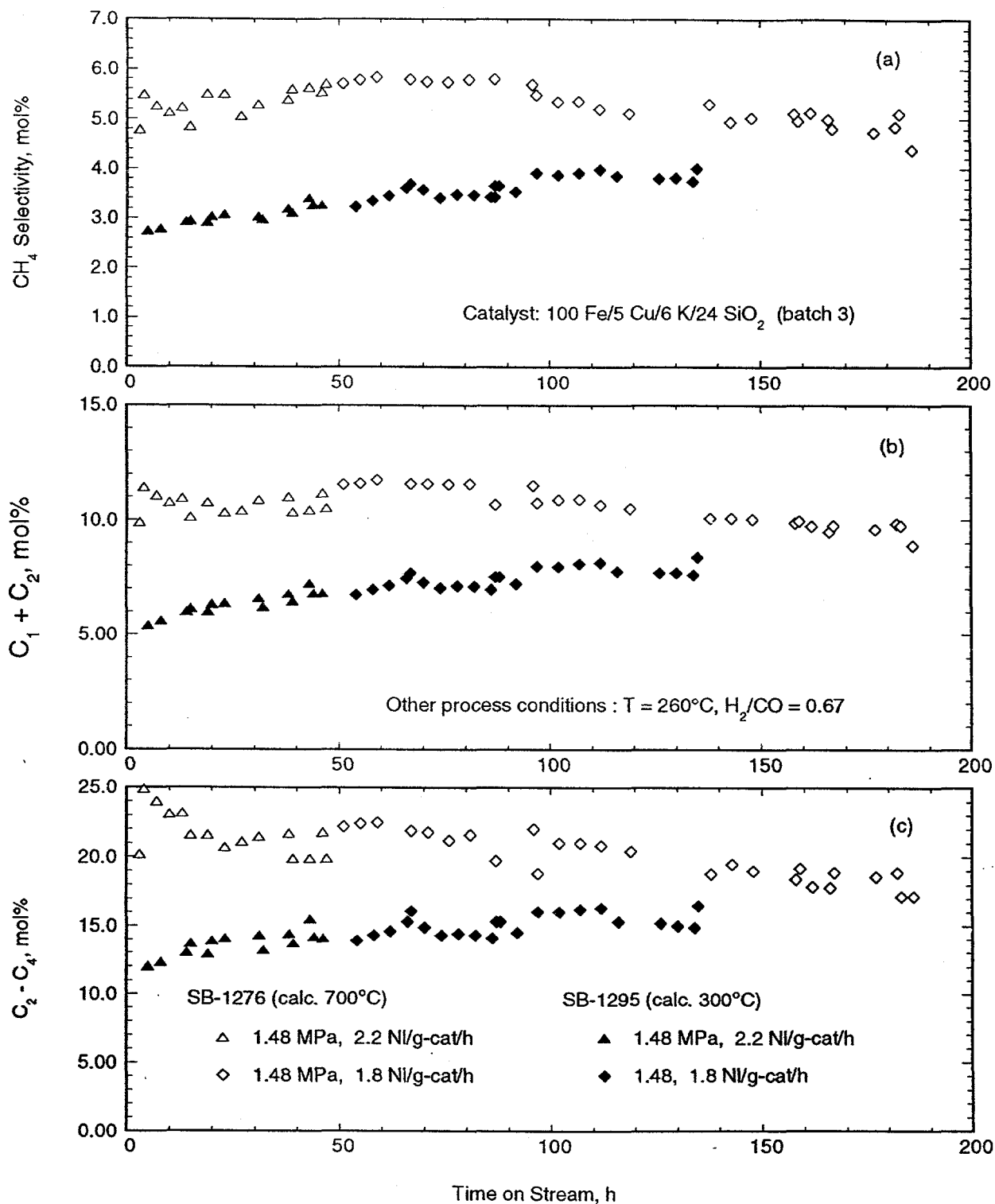


Figure 18. Effect of calcination conditions on (a) methane selectivity, (b) C₁+C₂ selectivity and (c) C₂-C₄ selectivity in STSR tests with the 100 Fe/5 Cu/6 K/24 SiO₂ catalyst.

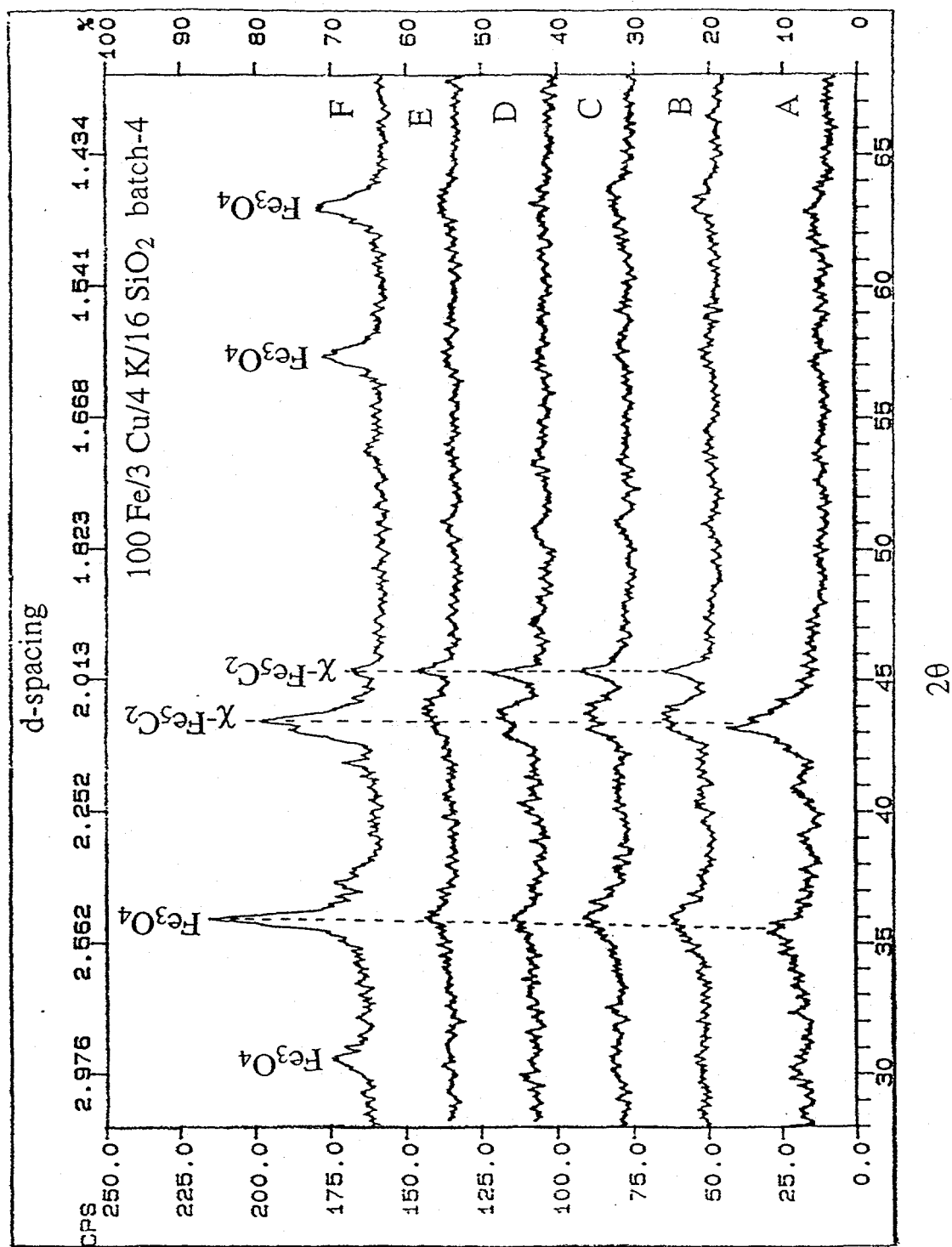


Figure 19. XRD patterns of catalyst samples withdrawn from slurry reactor test SA-0946 with catalyst C reduced at 280°C in CO for 8 h (A) TOS = 0 h; (B) TOS = 113 h; (C) TOS = 229 h; (D) TOS = 354 h; (E) TOS = 427 h; (F) TOS = 563 h.

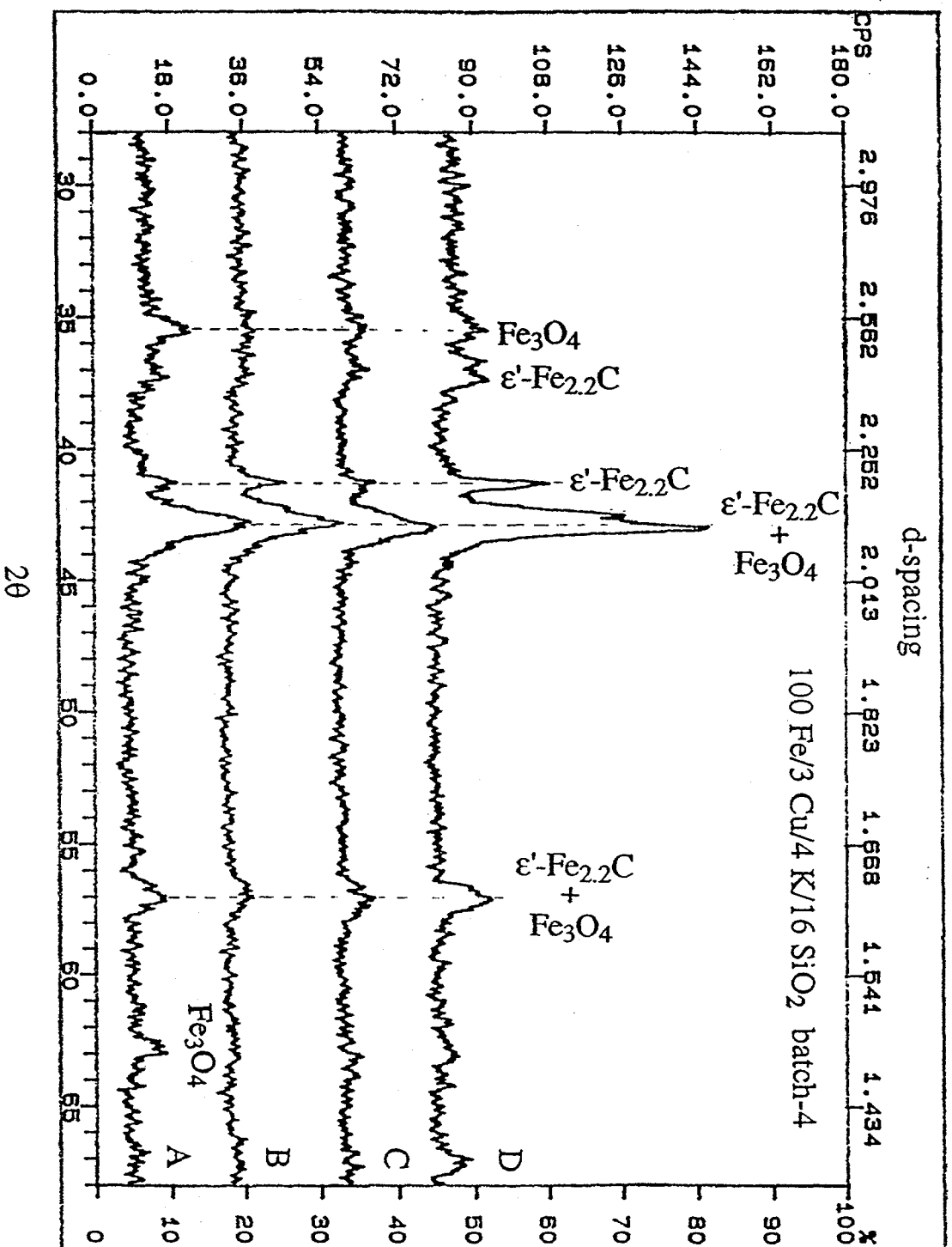


Figure 20. XRD patterns of catalyst samples withdrawn from slurry reactor test SA-1626 with catalyst C reduced at 280°C in syngas for 8 h: (A) TOS = 0 h; (B) TOS = 139 h; (C) TOS = 258 h; (D) TOS = 403 h.

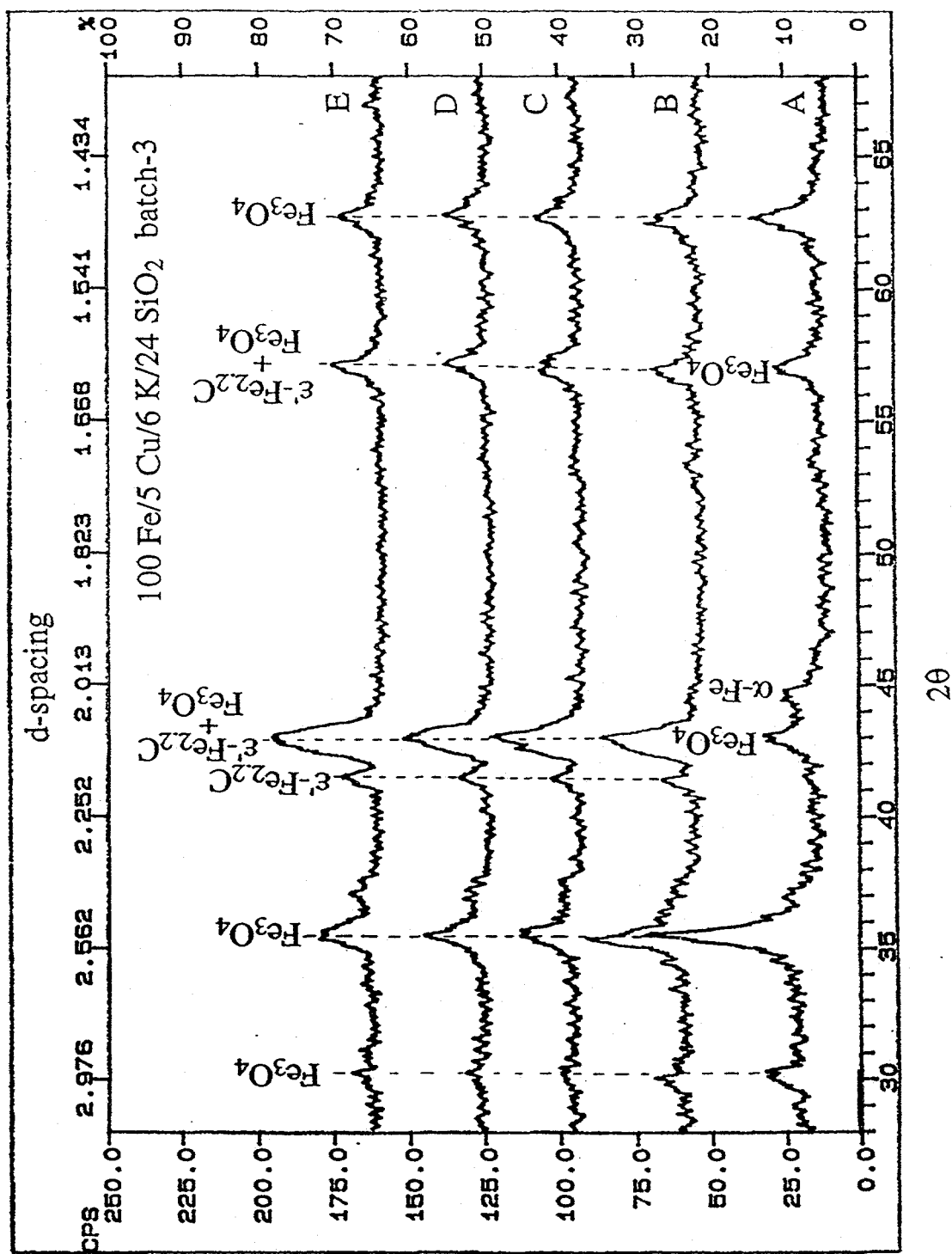


Figure 21. XRD patterns of catalyst samples withdrawn from slurry reactor test SB-1276 with catalyst B calcined at 700°C for 1 h, and reduced at 250°C in H₂ for 4 h: (A) TOS = 0 h; (B) TOS = 138 h; (C) TOS = 239 h; (D) TOS = 311 h; (E) TOS = 384 h.

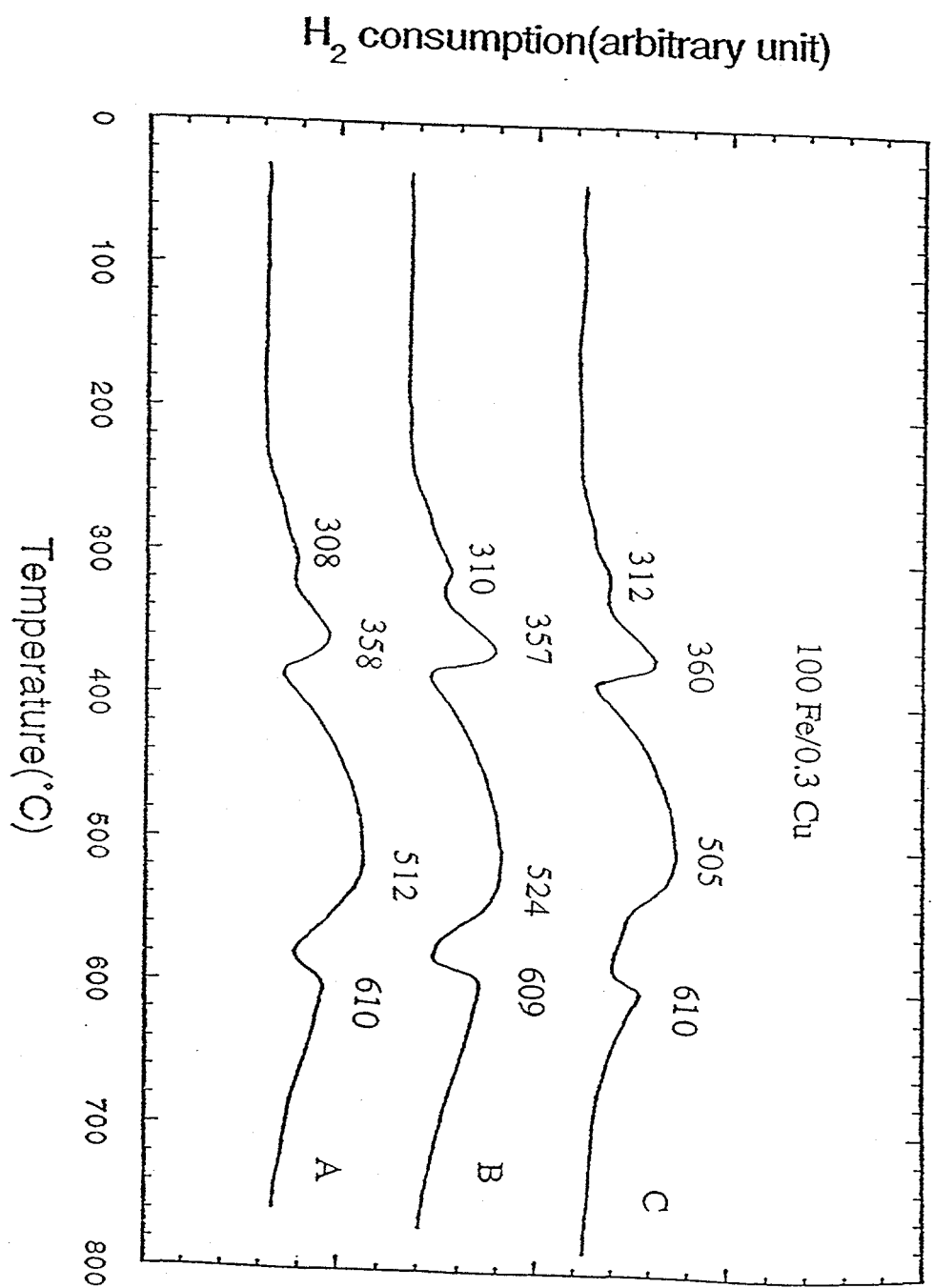


Figure 22. Reproducibility of three TPR experiments conducted with 100 Fe/0.3 Cu catalyst.

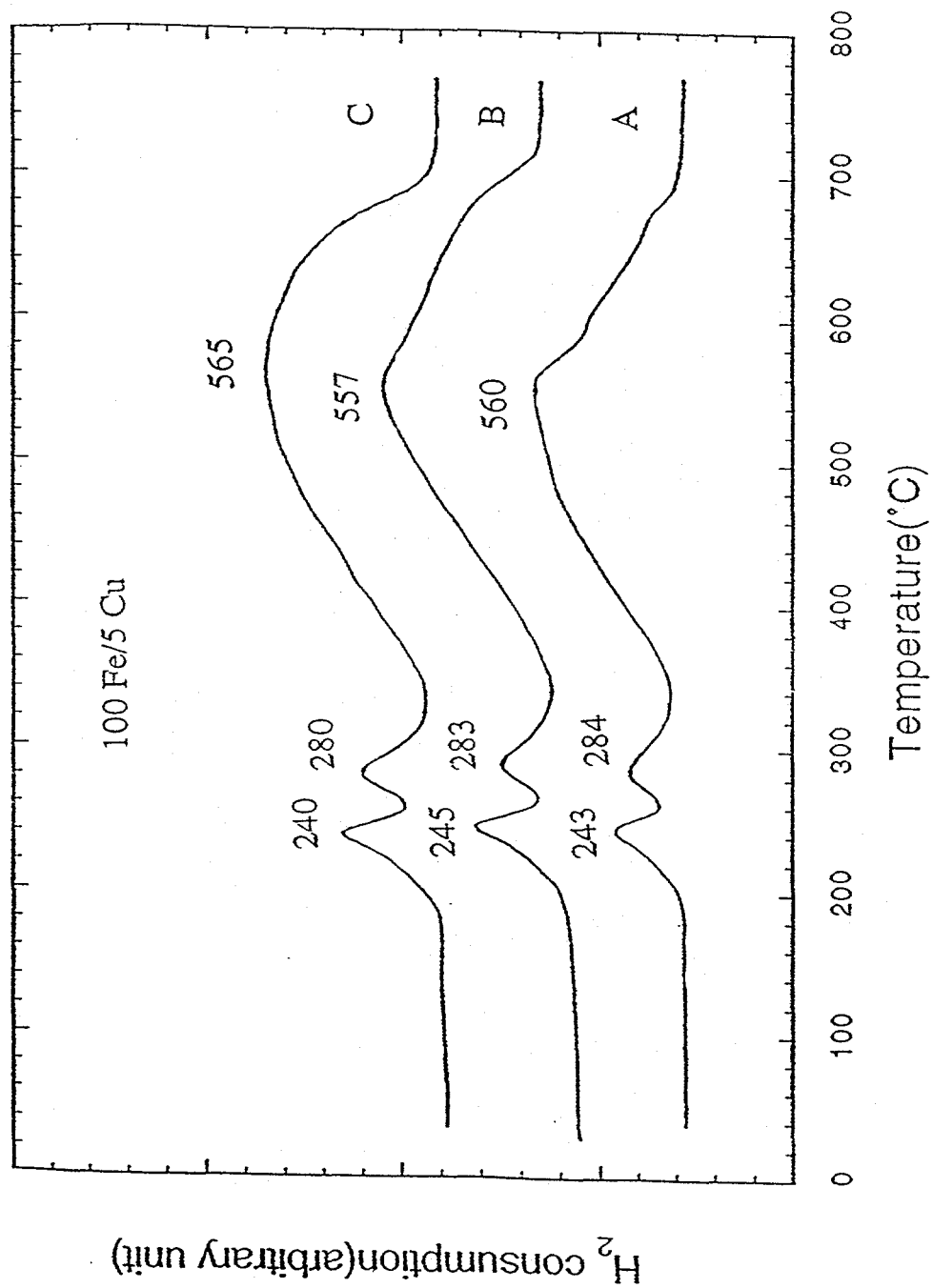


Figure 23. Reproducibility of three TPR experiments conducted with 100 Fe/5.0 Cu catalyst.

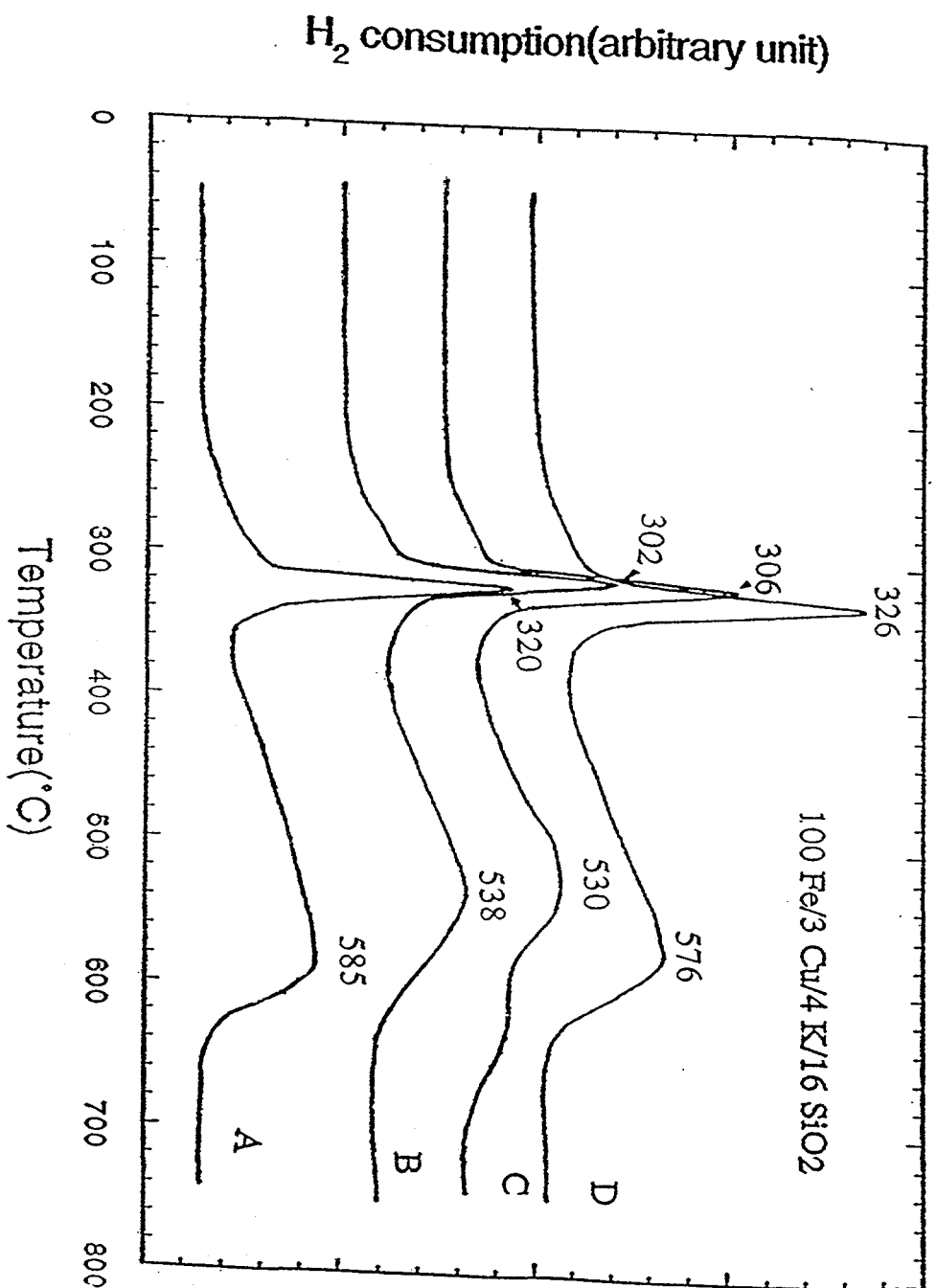


Figure 24. Temperature programmed reduction profiles of catalyst C (100 Fe/3 Cu/4 K/16 SiO₂) from different batches: (A) S3416-2; (B) S3416-2+K(2); (C) S3416-3+K(2); (D) S3416-4.

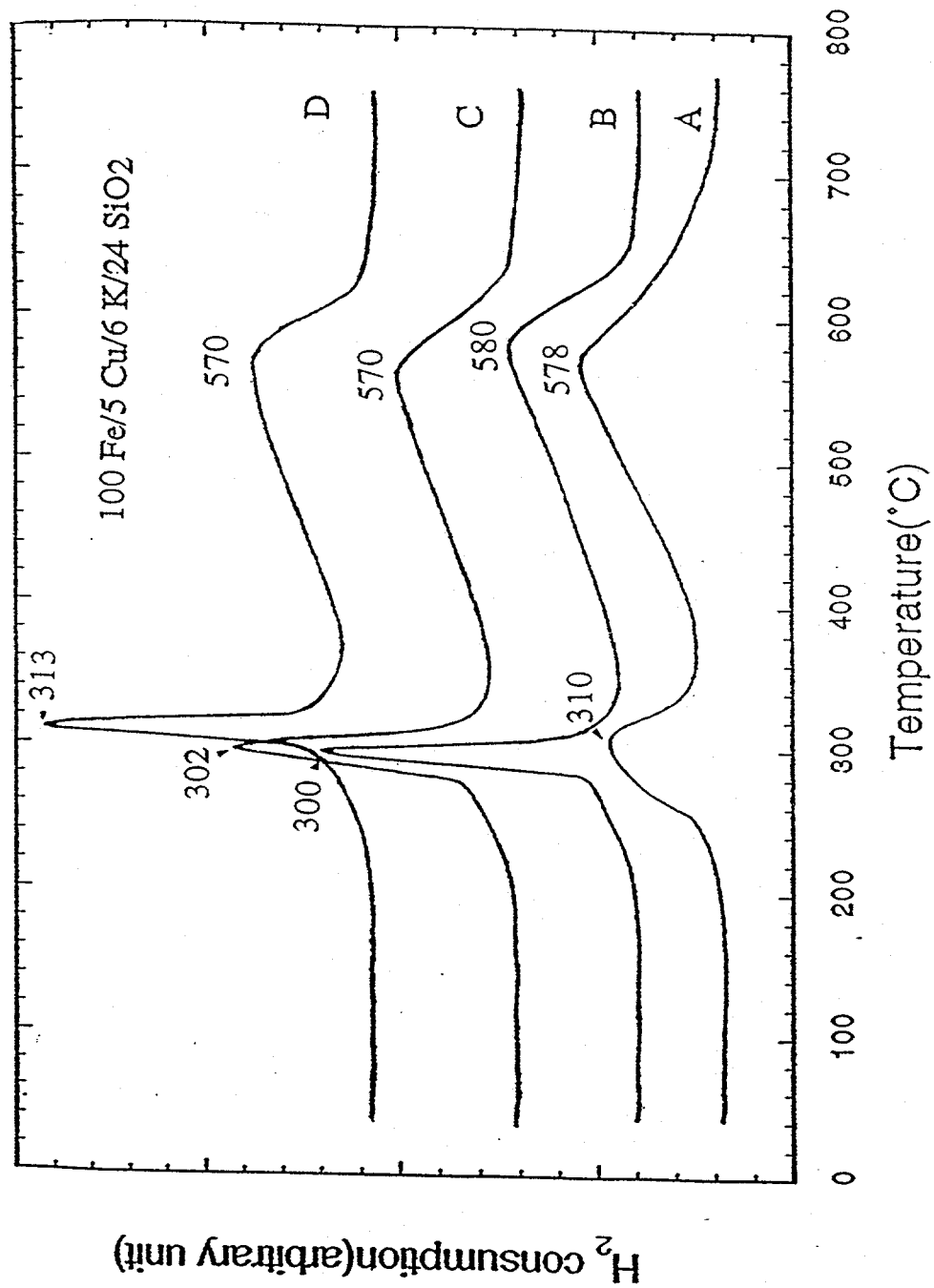


Figure 25. Temperature programmed reduction profiles of catalyst B (100 Fe/5 Cu/6 K/24 SiO₂) from different batches: (A) S5624-2; (B) S5624-3; (C) S5624-4; (D) S5624-5.

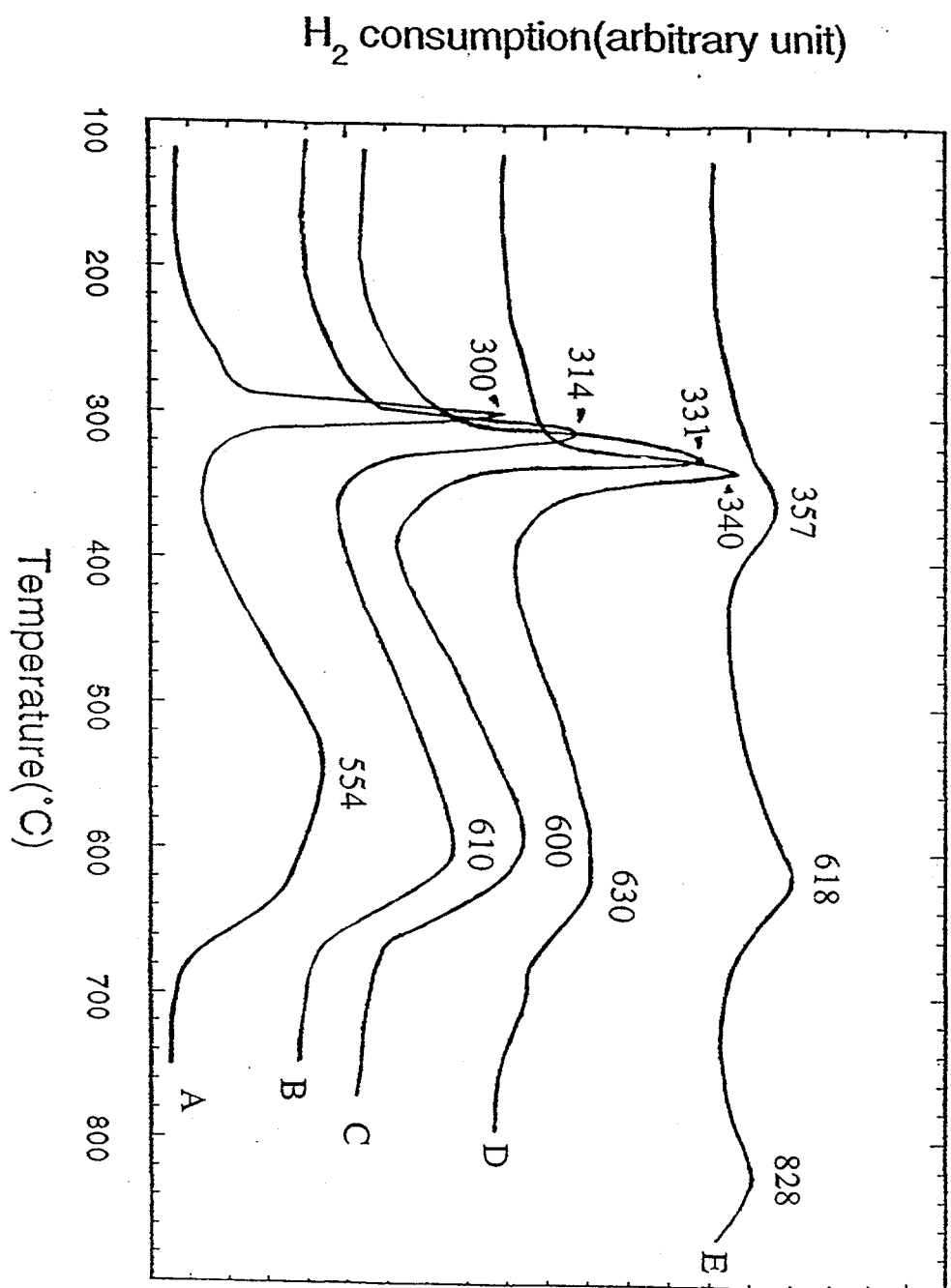


Figure 26. Effect of silica content on the reduction behavior of 100 Fe/5 Cu/4.2 K/ x SiO₂ catalysts: (A) x = 8; (B) x = 16; (C) x = 25; (D) x = 40; and (E) x = 100.

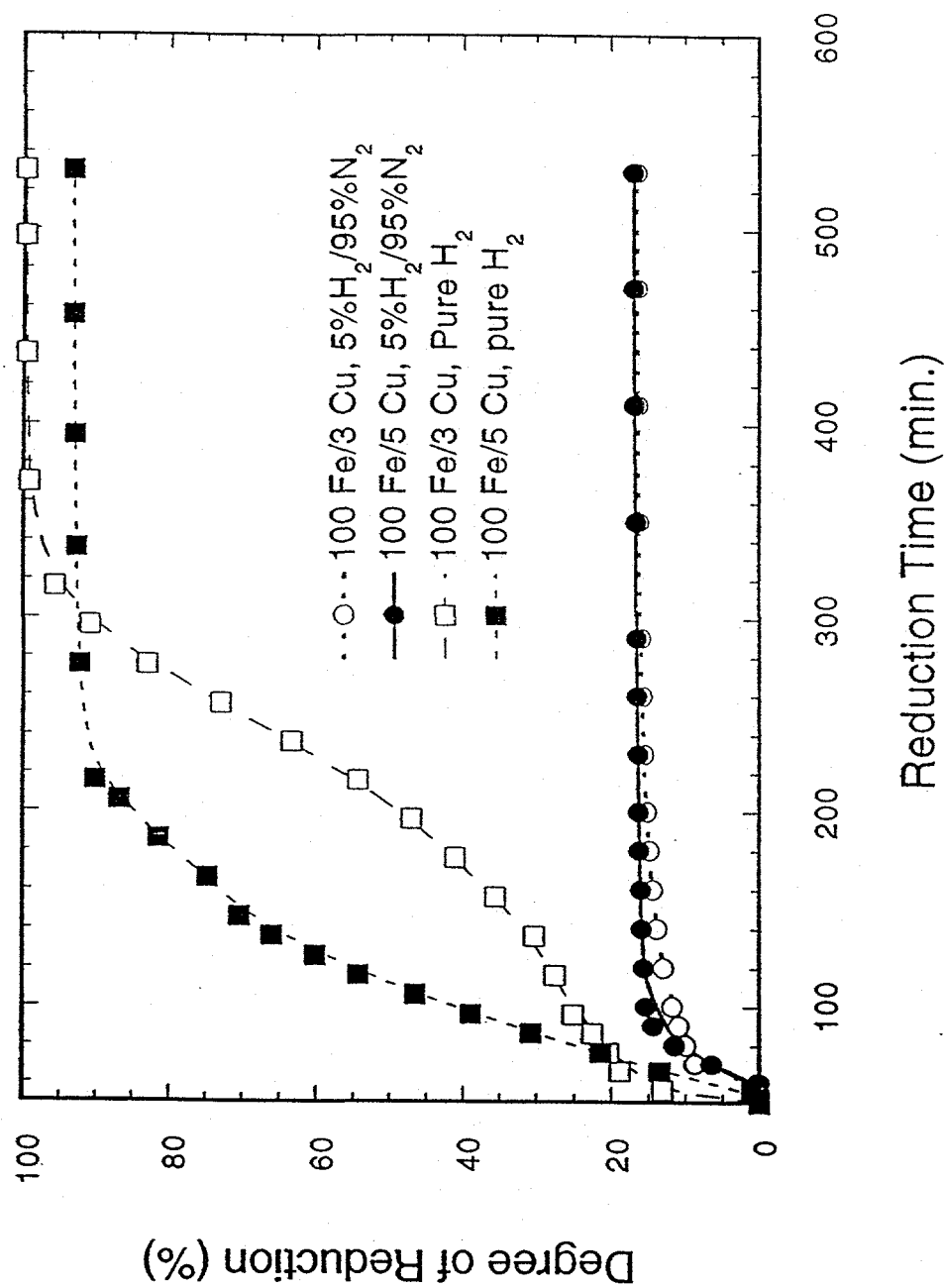


Figure 27. Effect of partial pressure of hydrogen on the reduction of 100 Fe/3 Cu and 100 Fe/5 Cu catalysts. Reduction conditions: Room temperature to 280°C at 5°C/min, then maintained at 280°C for 8 h; sample wt ~ 20 mg; flow rate = 40 ml/min.

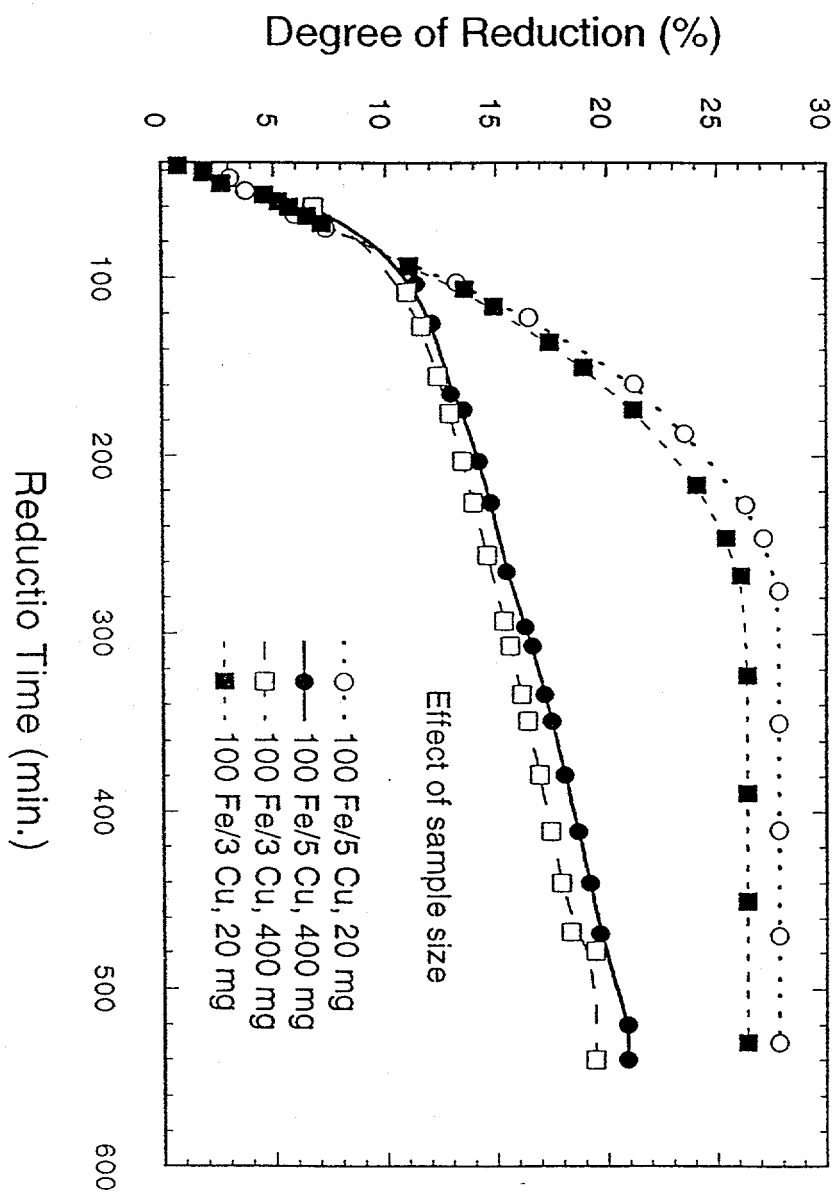


Figure 28.

Effect of sample size on reduction of 100 Fe/ Cu & 100 Fe/5 Cu catalysts. Reduction conditions: Room temperature to 280°C at 5°C/min, then maintained at 280°C for 8 h; flow rate = 40 ml/min.

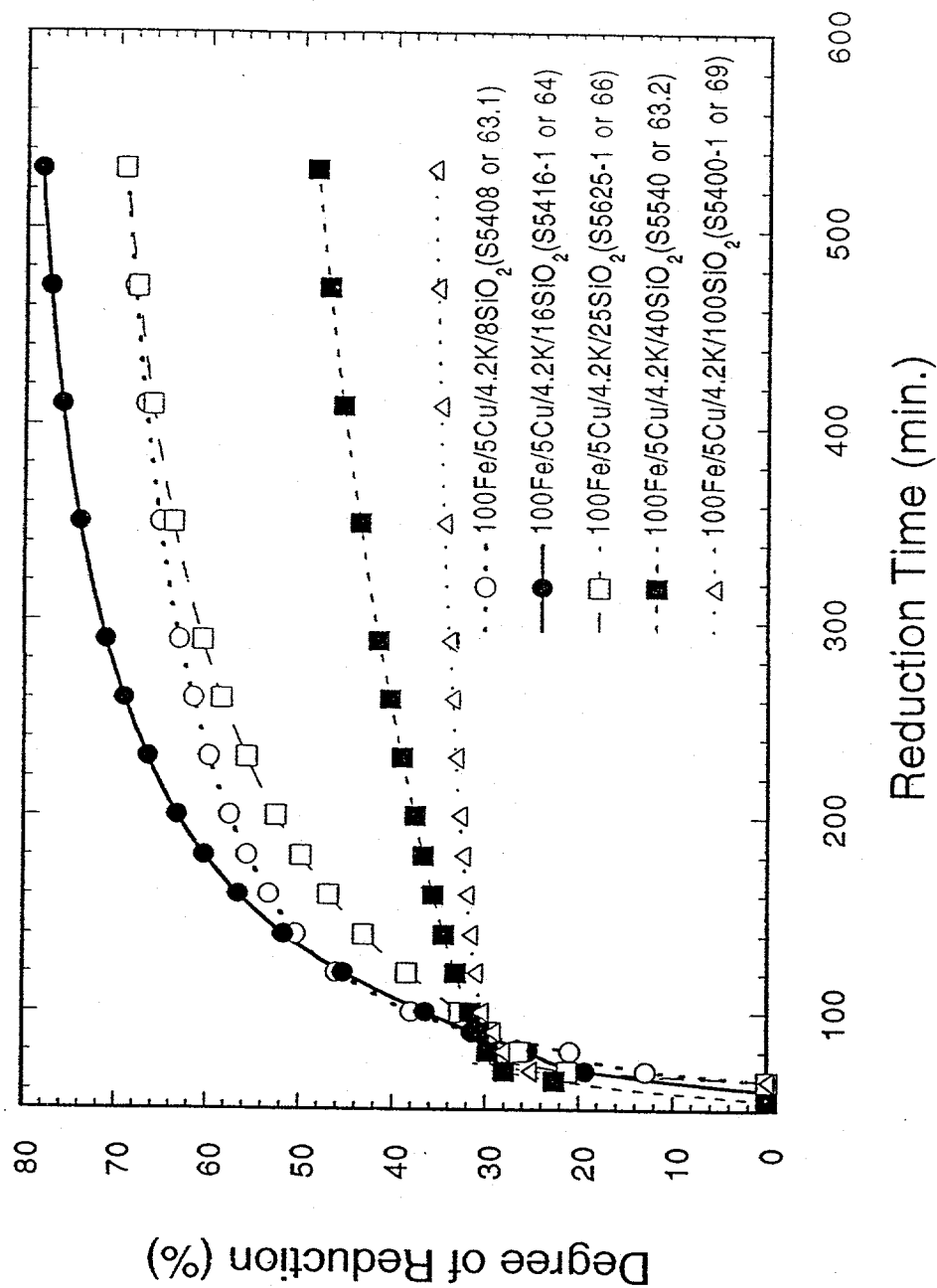


Figure 29.

Effect of silica content on the reduction behavior of 100 Fe/5 Cu/4.2 K/ x SiO₂, where x = 8 to 100. Reduction conditions: Pure hydrogen; sample wt ~ 20 mg; flow rate = 40 ml/min; room temperature to 280°C at 5°C/min, then maintained at 280°C for 8 h.

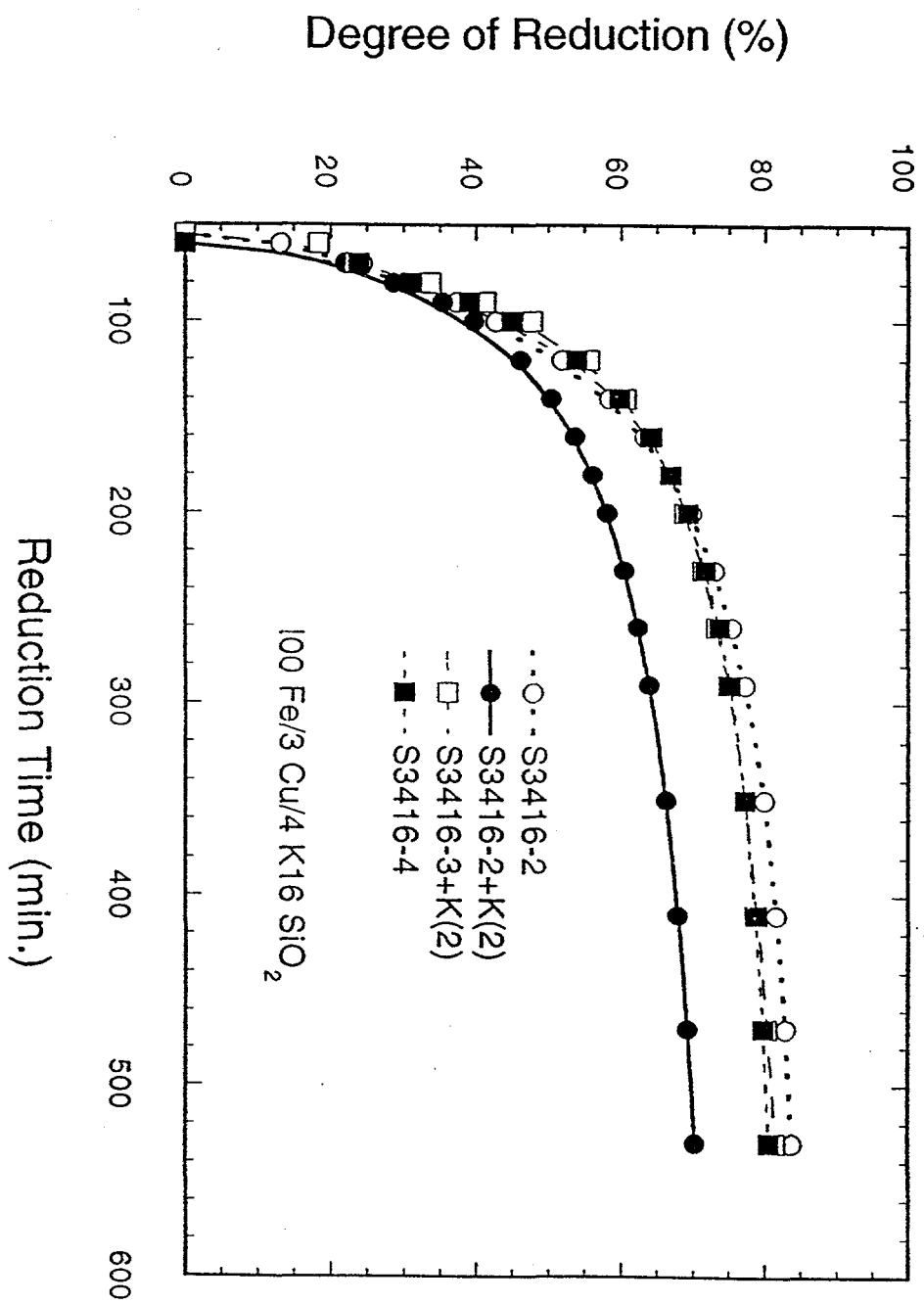


Figure 30. Isothermal reduction of catalyst C from different batches in TGA unit. Reduction conditions: Pure hydrogen; sample wt ~ 20 mg; flow rate = 40 ml/min; room temperature to 280°C at 5°C/min, then maintained at 280°C for 8 h.

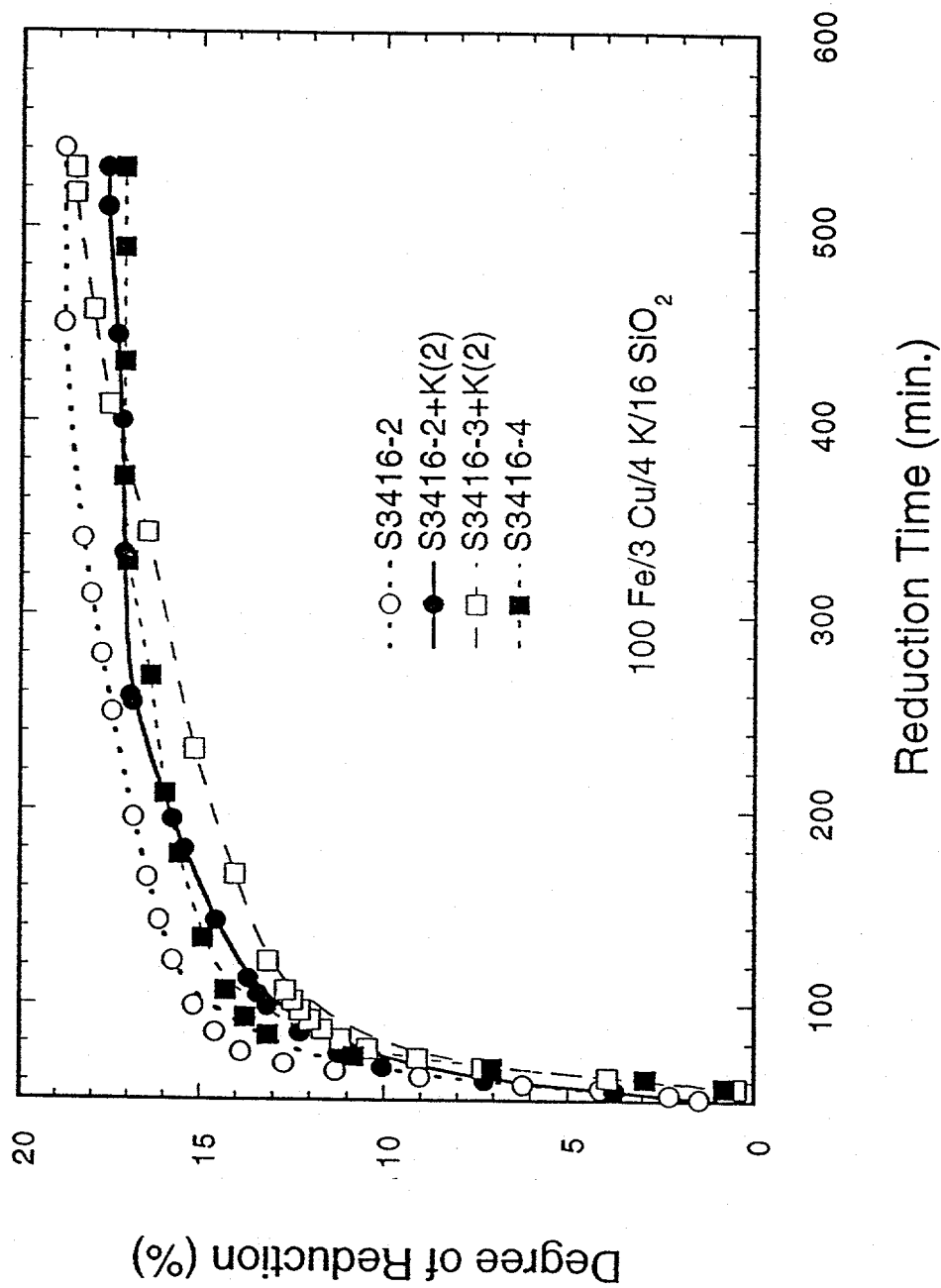


Figure 31. Isothermal reduction of catalyst C from different batches in TPR unit. Reduction conditions: 5% H₂/95% N₂; flow rate = 40 ml/min; sample wt = 400 to 500 mg; room temperature to 280°C at 5°C/min, then maintained at 280°C for 8 h.

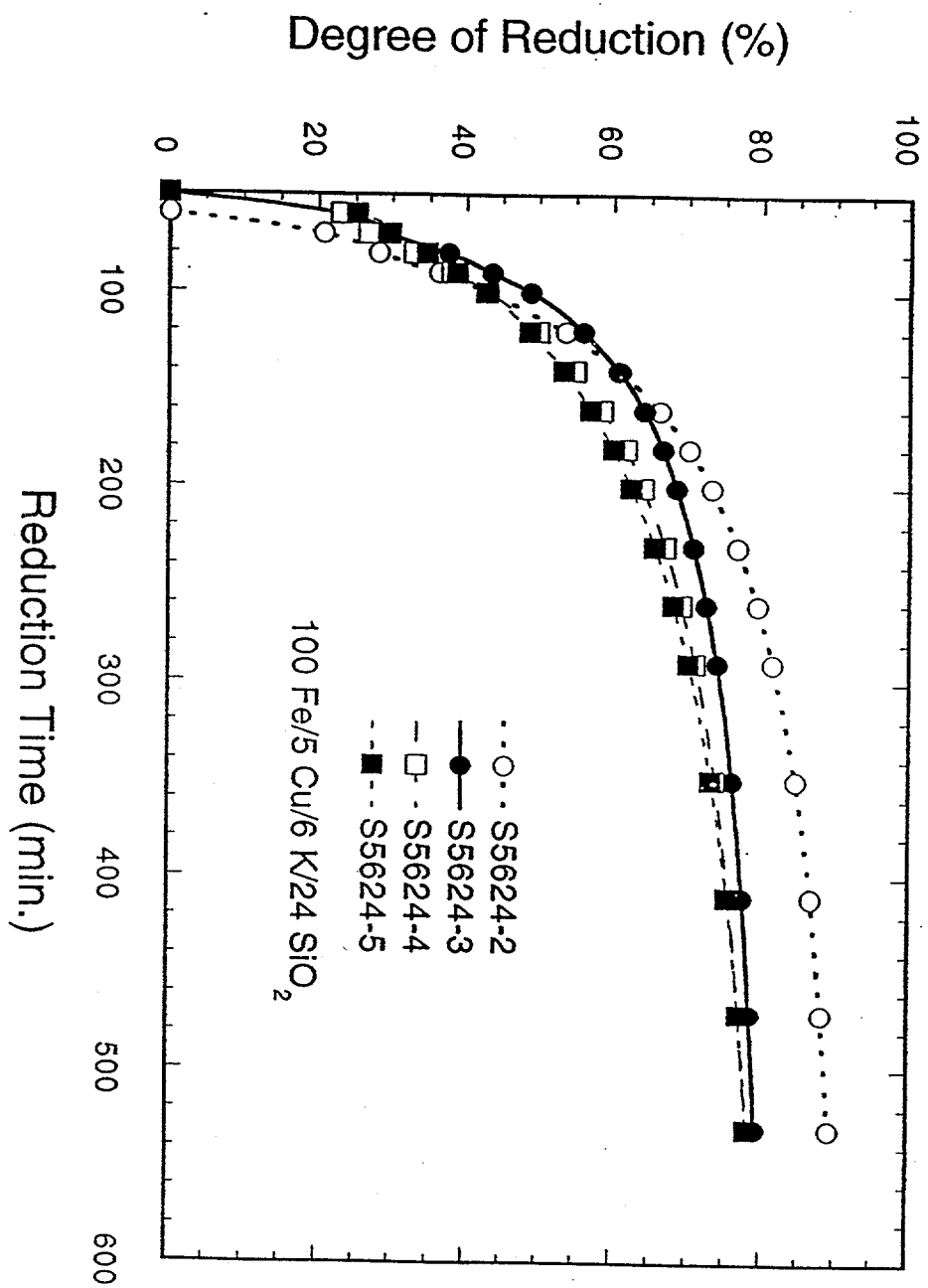


Figure 32.

Isothermal reduction of catalyst B from different batches in TGA unit. Reduction conditions: Pure hydrogen; flow rate = 40 ml/min; sample wt ~ 20 mg and room temperature to 280°C at 5°C/min, then maintained at 280°C for 8 h.

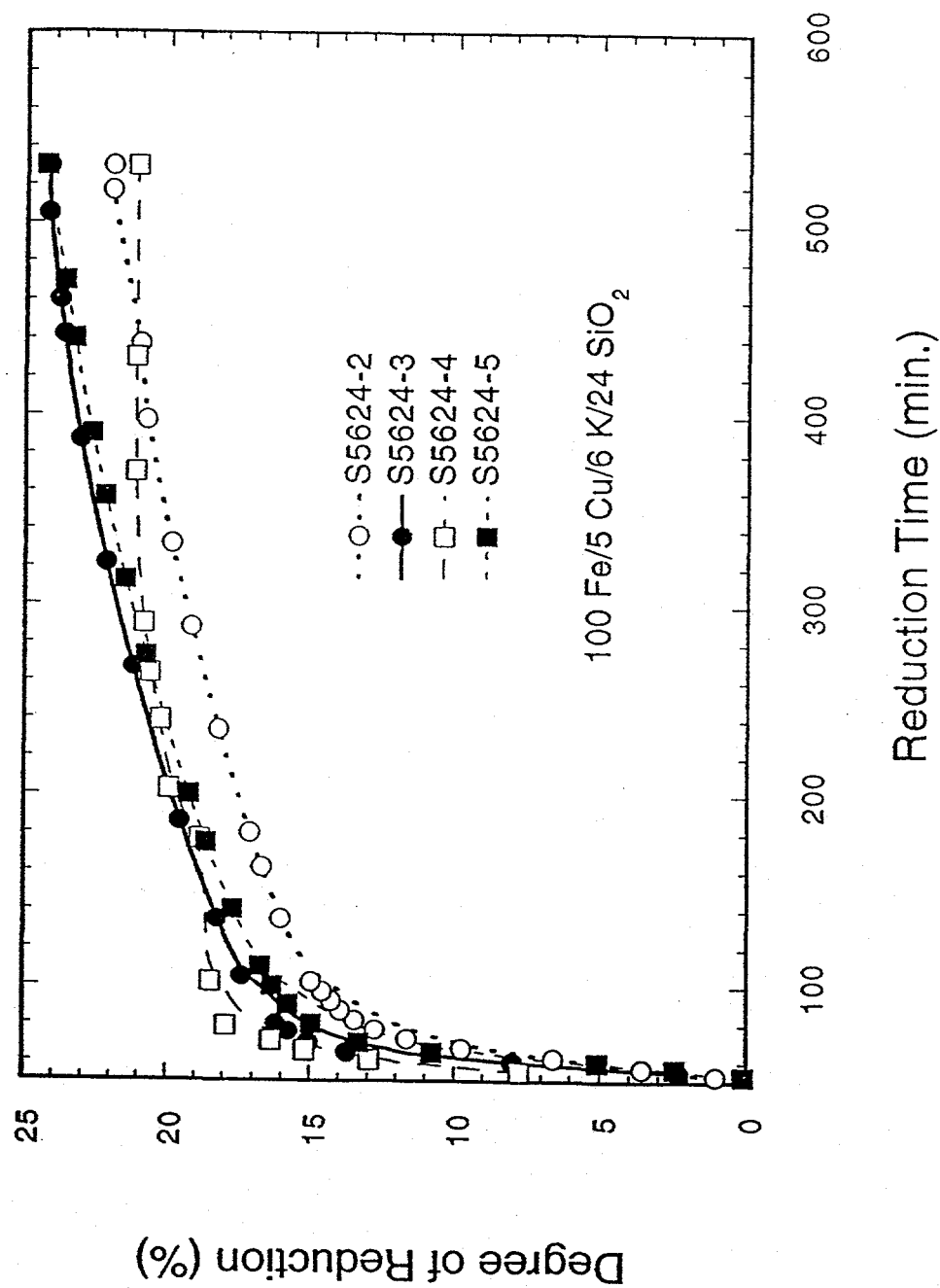


Figure 33. Isothermal reduction of catalyst B from different batches in TPR unit. Reduction conditions: 5% H₂/95% N₂; flow rate = 40 ml/min; sample wt = 400 to 500 mg; room temperature to 280°C at 5°C/min, then maintained at 280°C for 8 h.