

APPENDIX D: TRACE COMPONENT ANALYSIS OF SYNGAS

During the carbonyl burnout prior to Run No. AF-A1 (4/26/91-16:00 to 4/28/91-16:30), the syngas was analyzed for trace components such as iron carbonyl, nickel carbonyl, chloride and H₂S. The samples were taken at sample port #5 (hot reactor inlet) as well as sample port #3A (hot reactor outlet).

The carbonyl results are summarized in Table D1. Two methods were used to test for the presence of carbonyls: wet chemical analysis and gas chromatography using an electron capture detector (ECD). The GC analysis indicated 0-5 ppb iron carbonyl and 0-7 ppb nickel carbonyl. The wet chemical analysis showed about 6 ppb iron and 2 ppb nickel carbonyl. These levels are extremely low and very near the detection limits. The good agreement between these two methods lends credibility to the GC method.

The chloride and H₂S results are presented in Table D2. The H₂S content of the gas was < 2 ppb. Colorimetric tests for chloride indicated 1-2 ppb chloride. Wet chemical analysis was not sufficiently precise. Additional tests for chlorides by NUS Laboratory Services using NIOSH method P&CAM #115 (ion selective method for chlorine ion) indicated 3-8 ppm.

CONCLUSION: The trace component analysis indicates insignificant levels of catalyst poisons in the syngas.

**TABLE D1
IRON AND NICKEL CARBONYL ANALYSIS OF SYNGAS**

(Prior to Run No. AF-A1)

Results from GC Analysis

Date	Time	Gas Condition	Sample Port	Carbonyl Concentration (ppb)	
				Iron	Nickel
4/26/91	1800-1845	Cold, Once-Thru	5	0-3	0-4
4/26/91	1800-1845	Cold, Once-Thru	3A	0-5	0
4/27/91	0900-1630	Hot, Once-Thru	5	0-2	0
4/27/91	0900-1630	Hot, Once-Thru	3A	0-3	0
4/28/91	1020-1040	Hot, Once-Thru	5	0-3	0-7
4/28/91	1020-1040	Hot, Once-Thru	3A	0-2	0-6
4/28/91	1600-1620	Hot, Recycle	5	0-2	0
4/28/91	1600-1620	Hot, Recycle	3A	0-1	0

Results from Wet Chemical Analysis

Date	Time	Gas Condition	Sample Port	Carbonyl Concentration (ppb)	
				Iron	Nickel
4/26-27	2025-0825	Heating, Once-Thru	5	< 20	2
4/26-27	2025-0825	Heating, Once-Thru	3A	< 20	0.8
4/27/91	0950-1050	Hot, Once-Thru	5	< 5	< 5
4/27/91	0950-1050	Hot, Once-Thru	3A	6	< 5
4/27/91	1220-1830	Hot, Once-Thru	3A	6	< 2
4/27-28	2000-0850	Hot, Once-Thru	5	< 10	0.5
4/27-28	2000-0850	Hot, Once-Thru	3A	< 10	0.9
4/28/91	1020-1140	Hot, Once-Thru	3A	< 10	< 10

**TABLE D2
CHLORIDE AND SULFIDE (H₂S) ANALYSIS OF SYNGAS**

(Prior to Run No. AF-A1)

Results from Wet Chemical Analysis

Date	Time	Gas Condition	Sample Port	Chloride (ppb)	H ₂ S (ppb)
4/26/91	1825-2000	Cold, Once-Thru	5	< 1000	< 2
4/26/91	1825-2000	Cold, Once-Thru	3A	< 1000	< 2
4/26-27	2050-0825	Heating, Once-Thru	5	< 600	< 1
4/26-27	2050-0825	Heating, Once-Thru	3A	< 250	< 1
4/27/91	0930-1130	Hot, Once-Thru	5	< 1500	< 2
4/27/91	0930-1130	Hot, Once-Thru	3A	< 1500	< 2

Results from Chloride Colorimetric Test

Date	Time	Gas Condition	Sample Port	Chloride (ppb)
4/27/91	1920-2100	Hot, Once-Thru	5	< 10
4/27/91	1920-2100	Hot, Once-Thru	3A	< 10
4/28/91	1000-1515	Hot, Once-Thru	5	< 2
4/28/91	1000-1515	Hot, Once-Thru	3A	1-2

Results from Chloride Ion Selective Electrode Test

Date	Time	Gas Condition	Sample Port	Chloride (ppb)
4/27-28	2000-0850	Hot, Once-Thru	5	< 3
4/27-28	2000-0850	Hot, Once-Thru	3A	< 3
4/28/91	1000-1630	Hot, Once-Thru	5	< 6
4/28/91	1000-1630	Hot, Once-Thru	3A	< 6
4/28/91	1200-1630	Hot, Once-Thru	5	< 8