

Effects of Contaminants on Acid Gas Pyrolysis

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This research project studied the effects of various contaminants on the products of H₂S pyrolysis. The study was conducted at the University of Maryland Combustion Laboratory and examined products of the reaction with variable inlet gas compositions over a wide range of temperatures to determine the effects of the contaminants on the reaction. Examined contaminants included benzene, xylene and superheated steam/carbon dioxide mixture. Benzene was examined at 0.8% molar concentration with 90% N₂ dilution across a temperature range of 1000C - 1400C. Xylene was examined at 0.6% molar concentration with 90% N₂ dilution across a temperature range of 1000C - 1400C. Superheated steam in the presence of 40%/60% acid gas was examined between 0% - 20% molar concentrations at 1200C. Results indicated that aromatic contaminants tended to increase H₂ production and H₂S conversion while simultaneously producing carbon disulfide (CS₂). Sulfur deposits were significantly contaminated with carbon. H₂ production and H₂S conversion followed a similar positive quadratic trend as thermodynamic simulations, but measured values were significantly greater than expected. CS₂ production against temperature followed a strongly positive trend, opposite of the weakly negative trend expected by simulations. Superheated steam in acid gas slightly increased H₂ and CO production, but decreased inlet gas conversion. However, measured results, although quadratic, did not closely match thermodynamic simulations possibly due to unexpected radical auto-acceleration. Experiments should be retested with longer residence times and more accurate inlet flow controllers to confirm these findings.

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