Techno-Economic analysis of CO_2 utilization as a source from the Steel-making Plant

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Blast furnace gas is generated from blast furnace steelmaking in which steel ore, coke and limestone are heated and melted in a blast furnace. It is commonly used to produce electricity or released to atmosphere. As an alternative to emission of CO_2, it can be utilized as a carbon source to produce C1 value-added chemicals. In this study, we proposed two cases of methanol production and co-production of methanol and ammonia from blast furnace gas. Both cases were simulated using Aspen Plus V12 and economics were evaluated using Aspen Process Economic analyzer and from the previous study. As a result, the methanol production case produced 99.4 wt% 232 t/day of methanol and the co-production case produced 97.7 wt%, 453.4 t/day of ammonia and 99.8 wt%, 263 t/day of methanol. The NPV of the two cases are US -1009.3 M$ at the methanol production case and US -1200.9 M$ at the co-production case. This is due to the high cost of hydrogen. Sensitivity analysis is performed to show the variability of NPV as a function of the economic parameters for all cases. If the raw material cost decreased 30 %, the co-production case was more economically feasible at the point of the NPV.