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P2.236 Biomass gasification with high temperature heat and economic assessment of Fusion-Biomass Hybrid System

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This paper aims to make a further investigation on economic analysis of fusion-biomass hybrid model based on previously reported concept. This system postulates to gasify cellulose and lignin which are compositions of biomass derived from agricultural and forestry sectors to produce synthetic gas for artificial diesel and hydrogen production. Gasification process ($C_6H_{10}O_5 + H_2O \longrightarrow 6H_2 + 6CO$) requires over 700oC of high temperature that blanket concept with LiPb and SiC technology such as DCLL is applicable to deliver high thermal heat for endothermic gasification reaction. This technical extension enables to produce synthetic gas which converts into either artificial diesel by Fischer-Tropsch reaction ($2H_2 + CO \longrightarrow -CH_2- + H_2O$) or hydrogen by water-gas shift reaction ($CO + H_2O \leftrightarrow H_2 + CO_2$).

While many of the previous application processes of biomass applied partial oxidation, this gasification reaction is endothermic when the reactant is isolated from oxygen, and can be regarded as fusion energy conversion. A 30-year lifetime cost of fusion-biomass hybrid plant is analyzed and compared with fusion electricity that typically converted at 33% of thermal efficiency. Economic analysis method of Discounted Payback Period (DPBP) and Internal Rate of Return (IRR) describes the profitability of fusion-biomass hybrid plant with low feedstock cost from waste biomass suggests attractiveness of fusion biomass hybrid.

Thermogravimetric analysis (TGA) and differential thermal analysis (DTA) of cellulose and lignin to assess accurate amount of heat absorption, as the function of temperature will also be reported. In general, gasification at lower temperature yields more complicated chemical products than simple C1 products with smaller absorbing heat. Since reduction in CO_2 emission is expected by replacing fossil, fusion-biomass hybrid plant for clean fuel production can be attractive to deploy, because the role of liquid and gaseous fuels in transportation and industrial sectors can provide additional and potentially larger market chance for fusion.

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