# Article information:

ASPEN plus modelling of air–steam gasification of biomass with sorbent enabled CO2 capture - ScienceDirect
<https://www.sciencedirect.com/science/article/pii/S2405653716300173>

# Article summary:

1. Biomass is a renewable energy source that can be converted into syngas through thermo-chemical gasification, which is more favorable than the biochemical route.

2. ASPEN Plus process simulator can be used to model and simulate biomass gasification processes, including sorbent-enabled CO2 capture using CaO.

3. The developed model was validated by comparing its output with existing experimental results and was used to analyze the effect of operating parameters on product gas composition, lower heating value, and gasification efficiency.

# Article rating:

Appears moderately imbalanced: The article provides some useful information, but is missing several important points or pieces of evidence that would be required to present the discussed topics in a balanced and reliable way. You are encouraged to seek a more balanced perspective on the presented issues by exploring the provided research topics and looking at different information sources.

# Article analysis:

The article titled "ASPEN plus modelling of air–steam gasification of biomass with sorbent enabled CO2 capture" provides an overview of the use of biomass as a renewable energy source and the potential for thermo-chemical gasification to extract energy in the form of syngas. The article focuses on the use of ASPEN Plus process simulator to model and simulate sorbent enhanced air–steam gasification of biomass, which can considerably reduce the time and investment involved in exploring favourable process conditions.

The article provides a detailed description of the assumptions made in formulating the model, including the steady-state system with uniform temperature and pressure throughout, dilute gases except H2, CO, CO2, CH4 and N2 considered inert, biomass made up of Carbon, Hydrogen, Oxygen and Nitrogen, steam supplied at superheated condition of 1 bar and 200 °C, char assumed as graphitic carbon, and catalytic activity of CaO not considered.

The article also discusses the validation of the developed model by comparing its output with existing experimental results. The prediction accuracy is checked by comparing the model predicted syngas composition with experimental results from air–steam gasification and sorbent enabled steam and air–steam gasification. The deviation of the model results from experimental values is quantified by using statistical parameter RMS (root mean square) error.

However, there are some potential biases in this article that need to be addressed. Firstly, while it provides an overview of conversion routes for extracting energy from biomass reported by many researchers, it does not provide a comprehensive review or analysis of these routes. Secondly, it focuses only on sorbent enhanced air–steam gasification without considering other potential methods for CO2 capture such as chemical looping or membrane separation. Thirdly, it assumes that CaO is an economic and effective CO2 sorbent without providing evidence or comparison with other sorbents.

Furthermore, while the article discusses some limitations in modelling processes involved in gasification separately to reduce deviation from thermodynamic equilibrium models, it does not explore counterarguments or alternative approaches to address this problem. Additionally, while it notes that hydrogen has been receiving more attention as a future energy carrier due to being a clean fuel with higher energy density on mass basis than conventional fuels if produced from a sustainable source; it does not provide evidence or analysis on whether this is feasible or sustainable at scale.

In conclusion, while this article provides valuable insights into modelling sorbent enhanced air–steam gasification using ASPEN Plus process simulator; there are potential biases in its focus on one method for CO2 capture without considering alternatives or providing evidence for its effectiveness compared to other sorbents. It also lacks comprehensive analysis or exploration of counterarguments related to modelling processes involved in gasification separately or feasibility/sustainability concerns related to hydrogen production at scale.

# Topics for further research:

* Alternative methods for CO2 capture in biomass gasification
* Comparison of different CO2 sorbents for biomass gasification
* Chemical looping for CO2 capture in biomass gasification
* Membrane separation for CO2 capture in biomass gasification
* Challenges in modelling gasification processes and potential solutions
* Feasibility and sustainability of hydrogen production from biomass at scale

# Report location:

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