Parametric optimisation of hydrogen gas (H2) production from gasification of different types of biomasses using artificial neural network

Abstract

Considering the current environmental crisis, hydrogen gas (H2) can be used as the fuel of the future if it's production will be cost effective and carbon neutral. In this study, extensive literature review has been done to collect experimental data to be used in the training of the artificial neural network (ANN) capable of predicting the H2 yield by taking 14 biomass and process parameters as input. An equation has been obtained from the trained ANN to be used in the optimisation process using the MATLAB®. The developed ANN model can predict H2 yield with good accuracy i.e. regression = 0.967 and average percentage error of 8.63%. Multiple optimised solutions are predicted due to multi-objective optimisation. Results show that in some cases the H2 yield has increased and in some cases input process parameters have been optimised without the change in the H2 yield as compared to experimental H2 yield. This work supports the advancement of biomass-based hydrogen production by optimisation of key process parameters. The outcomes can benefit researchers and industries working on renewable energy and carbon reduction strategies.

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