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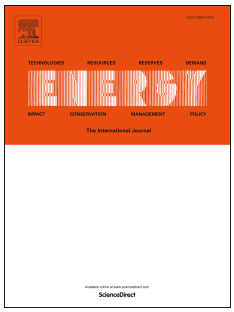

Optimum parameter design for performance of methanol steam reformer combining Taguchi method with artificial neural network and genetic algorithm

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Optimum parameter design for performance of methanol steam reformer combining Taguchi method with artificial neural network and genetic algorithm

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Abstract

The fuel cell is powered by H_2 widely provided by reforming processes. A promising reforming process is methanol steam reforming which has received much attention. This study then attempts to acquire high hydrogen concentration, high methanol conversion efficiency and low CO concentration of methanol steam reforming. Three operating parameters were investigated: reacting temperature (T=220 to 280 °C), steam-to-carbonate ratio (S/C=0.9 to 1.1), and the volume flow rate for nitrogen (N_2) carrier gas ($Q = 40$ to $100\ \mathrm{cm^3/min}$) as the flow rate of aqueous methanol solution was set as 3.1 cm^3/min. The integrated approach of combining the Taguchi method with radial basis function neural network (RBFNN) was proposed in this study to demand an optimum parameter design. The results showed that the optimum parameter design was: T=267 °C, S/C=1.1, and $Q = 40\ \mathrm{cm^3/min}$. The averaged percentage reduction of quality loss (PRQL) of 3.31% was obtained as optimum condition was implemented, in comparison with the starting condition (the largest reacting temperature, steam-to-carbonate ratio, and N_2