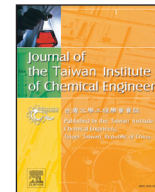




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## Modeling and optimization of carbon dioxide methanation *via in situ* hydrogen generated from aluminum foil and alkaline water by Box–Behnken design



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### ABSTRACT

The catalytic activity of carbon dioxide (CO<sub>2</sub>) methanation by *in situ* hydrogen generated from aluminum foil (Al) and alkaline water over a novel catalyst (AHZ–CM) was investigated. Response surface methodology involving Box–Behnken design (RSM–BBD) was implemented for optimization where the reaction temperature was found to be the utmost significant effective factor, followed by H<sub>2</sub>/CO<sub>2</sub> ratio and weight catalyst loading. The optimum condition for CO<sub>2</sub> conversion was at 3.29 g of weight catalyst loading, H<sub>2</sub>/CO<sub>2</sub> ratio of 4.08 and reaction temperature of 276.7 °C which resulted in 97.5% of CO<sub>2</sub> conversion. The result was approximately in agreement with the predicted result found by RSM which achieved 99.9% CO<sub>2</sub> conversion. Interestingly, this study proved that the hydrogen gas production from Al and alkaline water can be used *in situ* reaction and the novel catalyst (AHZ–CM) would be an excellent candidate to be used for CO<sub>2</sub> methanation reaction.

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