Optimization of process parameters for photoreforming of hydrogen evolution via response surface methodology (RSM): A study using Carbon@exfoliated g–C_3N_4

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ABSTRACT

In this present work, Carbon@exfoliated g–C_3N_4 was fabricated through a facile hydrothermal approach. Detailed characterizations were performed to examine the crystal structure, specific surface area, elementary composition, morphology, optical properties and also photoreforming activities. The deposition of carbon onto the exfoliated g–C_3N_4 structure shows enhanced surface area of 43.9 m^2/g relative to bulk g–C_3N_4 (34 m^2/g). Additionally, UV–vis DRS evidenced the enhancement of light absorption in the visible region. The adequacy of the fitted quadratic model was validated by values such as R–squared, F–value and p–value of 0.9922, 136.45 and <0.0001 respectively. The outcome of the optimized model revealed highest hydrogen yield of 997 µmol/g for time = 8 h, dosage = 0.75 g/L, formaldehyde concentration = 400 ppm and light intensity = 150 W/m^2 with error of 1.30% by validation experiment. Overall, the present research could be useful as a benchmark for photoreforming hydrogen production in large scale applications by considering the chosen parameters of this study.

KEYWORDS

CCD; Hydrogen; Optimization; Photocatalyst; RSM

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