Extended Abstract Journal of Nuclear Energy & Power Generation Technologies 2021
Vol.5 No.1

Green Energy 2021: Photo assisted methanation using CuO_2 nanoparticles supported on graphene as photocatalyst

Josep Albero

Universitat Politècnica de València (UPV), Spain

Abstract

Photoassisted CO_2 methanation can be carried out efficiently at 250 oC using Cu_2O nanoparticles supported on few layer graphene (Cu_2O/G) as photocatalyst. The Cu2O/G photocatalyst has been prepared by chemical reduction of a Cu salt (Cu $(NO3)_2$) with ethylene glycol in the presence of defective graphene obtained from the pyrolysis of alginate acid at 900 oC under Ar flow. Using this photocatalyst a maximum specific CH_4 formation rate of 14.93 mmol/gCu2O·h and apparent quantum yield of 7.84 % was achieved, which is one of the highest reported values for the gas-phse methanation reaction at temperatures below Sabatier reaction (>350 oC). It was found that the most probable reaction mechanism involves photoinduced electron transfer from the Cu2O/G photocatalyst to CO_2, while evidence indicates that light-induced local temperature increase and H2 activation are negligible. The role of the temperature in the process has been studied, the available data suggesting that heating is needed to desorb the H_2O formed as product during the methanation. The most probable reaction mechanism seems to follow dissociative pathway involving detachment of oxygen atoms from CO_2.