

Photocatalytic decomposition of bicarbonate to regenerate amine absorbent

송지윤, 전영시^{1,†}

전남대학교; ¹전남대학교 화학공학부

(ysjun@jnu.ac.kr[†])

Practical deployment of amine absorption process in large-scale CO₂ removal is limited by high amine regeneration cost. Tertiary alkanolamines or sterically hindered amines are considered promising alternatives to conventional amines due to the preferential formation of bicarbonate. This significantly lowers absorbent regeneration cost, which, however, does not completely eliminate necessity of the costly regeneration process. Here, we report a new method to regenerate amine absorbent via photocatalytic oxidation using graphitic carbon nitride under visible light. Bicarbonate anion is selectively decomposed into CO₂ by g-CN. Similar to the nature's way of turning protein enzymes on or off (reversible phosphorylation), bicarbonate anion selectively quenches the photoexcited holes on g-CN in the presence of tertiary amine, thereby boosting photocatalytic activity of g-CN by about twice. The photoexcited electrons are utilized in the photoreduction reaction that generates solar fuels, i.e. hydrogen. This strategy will pave a way to combining solar energy conversion process with the conventional industry as well as sustainable solar fuel production system using abundant resources.