Photocatalytic production of regenerated fuels under unconventional conditions

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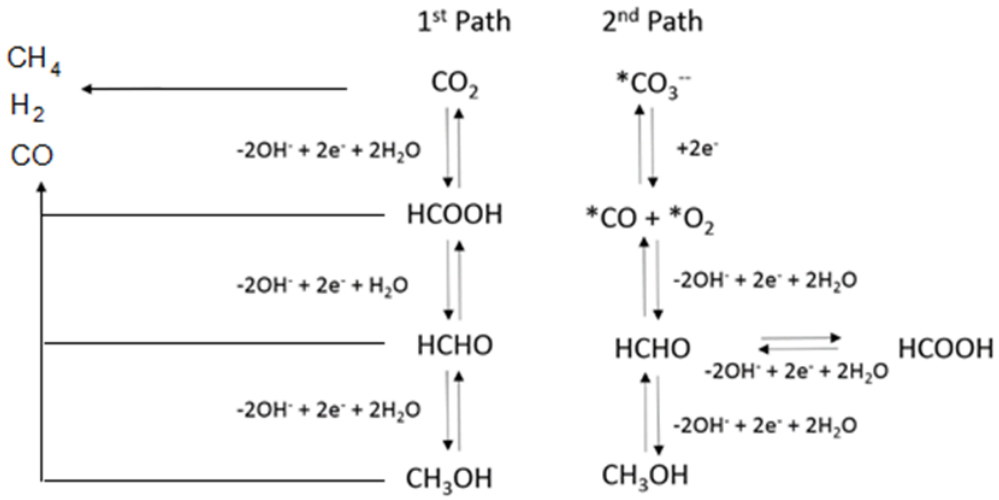
The photocatalytic reduction of CO_2 is a virtuous process to regenerate valuable chemicals and fuels through spent combustion products. It is therefore an intriguing strategy to convert a greenhouse gas while storing solar energy into a chemical form. Different products can be obtained, as sketched in the following scheme, but the productivity of the reaction is very low when operated at ambient pressure. The key to improve the reactivity of the system is to operate at high pressure, which is, however, a hard task in photocatalysis, due to the need of transparent windows made of fragile materials. To this purpose, a high pressure photoreactor operating up to 20 bar allowed overperforming most literature results in terms of energy stored and productivity. Furthermore, H_2 production through photoreforming of wastewaters containing organic pollutants to be removed represents a challenging way to produce an energy vector while cleaning wastewater. Also in this case, unconventional reaction conditions, especially increasing the operating temperature, allowed to boost the productivity of hydrogen in the case of photoreforming of carbohydrate containing wastewater.
This work discusses different photoreactor configurations and the effect of operating parameters for both the reactions



References

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