

Titanium-based catalyst systems for photo-catalytic CO₂ reduction

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The development of facile and robust photo-catalyst to establish the photo-catalytic CO₂ reduction in industrial scale would considerably reduce the amount of greenhouse gases in the atmosphere and as a renewable source of industrially valuable compounds like methanol, formic acid and other hydrocarbon compounds.

Ti-based compounds including TiO₂ remains to be the most robust photo-catalyst for CO₂ reduction with two main drawbacks: poor selectivity and high activation energy [1]. Incorporation of vanadium with titanium in ternary metal oxides considerably narrows the band gap energy from 3.2 eV for pure TiO₂ up to 1.7 eV for Ti-V-O ternary oxide with the increase of vanadium content, making the ternary oxide visible light active [2]. Ti-based MOFs are an ideal class of materials to apply as a catalyst for the range of photo-catalytic processes including the photo-reduction of CO₂ [3]. Introduction of Ti into MOF may allow to tune the photo-responsive properties and selectivity of titanium and enhance other properties of the catalyst as the porosity and stability by changing the organic counterpart. Herein we report on Ti_xV_yO_z and new type Ti-MOF composites and their photo-catalytic properties. The obtained composites were characterized by XRD, TEM, SEM, BET and TGA. The

CO₂ conversion rate was also studied by changing reaction parameters such as UV wavelengths, gas flow rate, etc.

Recent Publications

1. S. Nahar, M. F. Zain, A. Kadhum, H. Hasan and M. Hasan. *Materials* 10 (2017) 629.
2. M. Park, Y. Lim, Y. Sung, D. Kwak and J. Lee. *Acta Physica Polonica A*, 129 (2016) 875.
3. J. Zhu, P-Z. Li, W. Guo, Y. Zhao and R. Zou. *Coordination Chemistry Reviews* 359 (2018) 80.

Biography

Aigerim Baimyrza hold a BTech degree in Chemical Engineering of Organic Substance from Al-Farabi Kazakh National University and MSc degree in Polymer Material Science and Engineering from University of Manchester. After the graduation she joined Nazarbayev University (Astana, Kazakhstan) as a Teaching Assistant and the Institute of Batteries (Astana, Kazakhstan) as a Junior Researcher. Currently she is a Research Assistant in Nazarbayev University and a part of research team working on photo-catalytic conversion of CO₂ into hydrocarbon fuel.

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