

Catalysts for the conversion of CO₂ to methanol

L.Chianese¹, G.Iervolino¹, R.Viscardi², C.Bassano², V.Vaiano¹, V. Palma¹

(lchianese@unisa.it)

¹Department of Industrial Engineering, University of Salerno, Via Giovanni Paolo II, 132, 84084 Fisciano (SA), Italy.

²Casaccia Research Center, ENEA, Santa Maria di Galeria, Roma, 00123, Italy

Fossil fuels, nowadays, are still the major sources for energy production. Because of their nature, they are the main responsible for greenhouse gasses (GHG) emission, such as CO₂, CH₄ and NO_x, which contribute to global warming. Because of this problem, the world is moving towards more sustainable solution such as hydrogen or methanol. Between the two of them, due to the high costs of hydrogen purification and difficulties in storage and transport, the best competitor to fossil fuel results to be methanol that can be used as energy carrier for hydrogen storage and transportation. It is also an important compound which can be transformed into more complex chemicals as acetic acid, dimethyl ether (DME), methylamine or into intermediate and synthetic hydrocarbons including polymers and single-cell protein. Moreover, because of its high octane number, can be mixed with gasoline without any modification in the vehicle engine. So, Methanol can be considered the most promising building blocks in the chemical industries in order to obtain different products.

Methanol synthesis have been studied for years starting from different carbon-containing feedstock such as natural gases, coal, biomass or synthesis gas. An interesting solution can be atmospheric CO₂ and electrolytic H₂ feedstock conversion that can solve both the need for methanol production and the reduction of CO₂ in the atmosphere.

Because of byproduct formation such as higher alcohol or hydrocarbons, a selective catalyst is needed for methanol synthesis.

In this work, Cu/ZnO-based catalysts have been studied for methanol production starting from gaseous stream containing CO₂ and H₂. The performances are evaluated and compared with commercial Cu/ZnO catalyst in methanol selectivity, methanol yield, activity, stability and also operating condition.