

One-pass CH₄ carbonylation with CO₂ to acetic acid over CeO₂-ZnO/MMT: A mechanistic comprehension

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Conversion of CH₄ and CO₂ into value-added products has vital environmental and economic importance. Their direct conversion to acetic acid is challenging due to high activation energy. Therefore, kinetic and mechanistic fundamentals must be understood. As such, co-conversion of CH₄ and CO₂ to acetic acid reaction was carried out over CeO₂-ZnO/MMT catalyst and mechanism was tracked by quick solid state NMR, TGA, and FTIR. The reaction mimics Langmuir-Hinshelwood kind of mechanism over dual active site catalyst with reactants non-competing, preferential adsorption. The results display Zn-COOH formation is much easier, than Ce-COOH, which is confirmed to be accurate by DFT calculations. This work was supported by Basic Science Research Program through the National Research Foundation of Korea (NRF) funded by the Ministry of education. (NRF-2017R1D1A1B03036324).