

Syngas production from ethanol dry reforming using Cu-based perovskite catalysts

a Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia.

b CSIR, National Environmental Engineering Research Institute (CSIR-NEERI), Nehru Marg, 440020, Nagpur, India.

c Institute of Chemical Technology, Vietnam Academy of Science Technology, 1 Mac Dinh Chi Str., Dist. 1, Ho Chi Minh City, Viet Nam.

d Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Katahira 2-1-1, Aoba-Ku, Sendai 980-8577, Japan.

e Centre of Excellence for Advanced Research in Fluid Flow, Universiti Malaysia Pahang, 26300 Gambang, Kuantan, Pahang, Malaysia.

*Corresponding author: Mohd Sabri Mahmud, Senior Lecturer
Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang, Lebuhraya Tun Razak, 26300 Gambang, Kuantan, Pahang, Malaysia.
mohdsabri@ump.edu.my

Abstract:

This paper reports about production of syngas from dry reforming of ethanol (EDR) by using LaCuO₃ and CeCuO₃. The catalysts were prepared via the citrate sol-gel method and characterized by BET, TPO, H₂-TPR, FTIR, HR-TEM, SEM-EDX and XPS. The EDR tests were run in a stainless-steel fixed-bed reactor under the atmospheric pressure. Gas hourly space velocity, GHSV = 42 L_{gcat}-1h⁻¹ and mean particle size 100 – 140 μm were used for all runs to ensure the negligible internal and external mass transport resistance. The X-ray diffraction analysis of LaCuO₃ and CeCuO₃ catalysts registered the phases of CuO, La₂O₃, CeO₂ and LaCuO₃ on the surface of the catalysts after calcination. The ethanol and CO₂ conversions were increased at excess CO₂ feed and decreased at excess ethanol feed under the pressure varied from 20-50 kPa. The metallic states of Cu, La₂O₃ and CeO₂ were confirmed with the XRD and XPS analysis. Two peaks of metal oxidation were recorded by H₂-TPR for both catalysts where LaCuO₃ showed lower reduction than CeCuO₃. Result of FTIR showed C-O, C-H and hydroxyl group beside metal oxides. The catalytic activity of LaCuO₃ is higher than the CeCuO₃ catalyst at stoichiometric ratios (Ethanol/CO₂: 1/1), 1023 K with the ethanol and CO₂ conversions of 74 and 18 % respectively.

Keywords: Ethanol Dry Reforming; Perovskites; Copper; Syngas

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