



HAL
open science

Investigation of CuAl-layered double hydroxides as efficient electrocatalysts of CO₂ reduction

Ali Tarhini, Mélanie Guyot, Cyrille Costentin, S. Chardon-Noblat, Christine Mousty, Prévot Vanessa

► **To cite this version:**

Ali Tarhini, Mélanie Guyot, Cyrille Costentin, S. Chardon-Noblat, Christine Mousty, et al.. Investigation of CuAl-layered double hydroxides as efficient electrocatalysts of CO₂ reduction. Journées d'Electrochimie JE2022, Jul 2022, Mons, Belgium. hal-04687973

HAL Id: hal-04687973

<https://hal.science/hal-04687973v1>

Submitted on 9 Sep 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Public Domain

Investigation of CuAl-layered double hydroxides as efficient electrocatalysts of CO₂ reduction

TARHINI Ali^{(a)}, GUYOT Mélanie^(b), COSTENTIN Cyrille^(b), CHARDON-NOBLAT Sylvie^(b), MOUSTY Christine^(a), PREVOT Vanessa^(a)*

^(a) Institut de Chimie de Clermont-Ferrand, Clermont-Ferrand (France)

^(b) Département de Chimie Moléculaire, Grenoble (France)

* ali.tarhini@etu.uca.fr

The emission of CO₂ by industrial action has a serious impact on our environment which leads us to look for ways to decrease the emitted CO₂ to the atmosphere. The electrochemical conversion of CO₂ (CO₂ER) into other molecules such as CO, HCOOH, CH₃COOH, and CH₄ is one of the many ways to achieve this goal. Not only it will help to reduce pollution, but it will also convert CO₂ to valuable products to use as a feedstock.^[1] Recently, efficient copper based electro-catalysts for CO₂ER were prepared from layered double hydroxides (LDH) ^[2]. Using CuAl-NO₃ LDH prepared by the coprecipitation method and thermal treatments, a morphology control allowed to improve the catalytic activity by tailoring the structure of active sites and increasing the surface area/number of active sites. The resulting catalyst promoted the electrochemical conversion, in galvanostatic conditions, of CO₂ to CO and HCOOH with a faradaic efficiency (FY) up to 42% and 22%, respectively.

In the present work, the influence of the chemical composition of Cu based LDH of both the layer and the interlayer domain on the CO₂ER was studied. Several copper based LDH were synthesized by varying the synthetic method and taking into account the Cu/Al ratio and the interlayer anion (CO₃²⁻, Acetate Ac and dodecylsulfate SDS). The electrochemical behavior of these phases was first studied in cyclic voltammetry in different electrolytes under CO₂ saturated atmosphere in order to put in light their electrocatalytic behavior towards CO₂ER. The experimental parameters were optimized to perform the macroscale electrolyses. Among the different phases tested, Cu₂Al-CO₃ LDH phase prepared by coprecipitation showed the highest faradaic yield of HCOOH in 0.5 M KCl, reaching 48%.

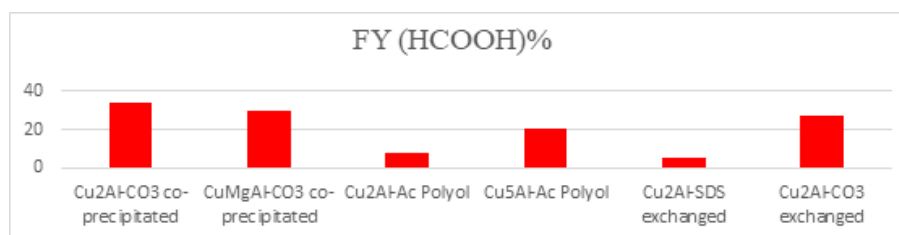


Figure.1: Faradic yields of HCOOH formation by copper based LDH synthesized by different methods in 0.45 M KHCO₃

The authors would like to thank the French ANR (CALHYCO2 - ANR-19-C05-0015) for their financial support.

References

Journée d'Electrochimie 2024

1er – 5 Juillet 2024

Saint-Malo, France

[1] H.-R. M. Jhong, S. Ma, P. J. A. Kenis, *Curr. Opinion Chem. Eng.* 2 (2013) 191-199.

[2] K. Iwase, T. Hirano, I. Honma, *ChemSusChem*, 15 (2022) 1-6