

Article

Thermocatalytic Hydrogenation of CO₂ to Methanol Using Cu-ZnO Bimetallic Catalysts Supported on Metal–Organic Frameworks

Zama G. Duma ^{1,2}, Xoliswa Dyosiba ¹, John Moma ², Henrietta W. Langmi ³, Benoit Louis ⁴, Ksenia Parkhomenko ⁴ and Nicholas M. Musyoka ^{1,*}

- ¹ Centre for Nanostructures and Advanced Materials (CeNAM), Chemicals Cluster, Council for Scientific and Industrial Research (CSIR), Meiring Naudé Road, Brummeria, Pretoria 0184, South Africa; zduma@csir.co.za (Z.G.D.); xdyosiba@csir.co.za (X.D.)
 - ² Molecular Sciences Institute, School of Chemistry, University of the Witwatersrand, Private Bag 2001, Johannesburg, South Africa; john.moma@wits.ac.za
 - ³ Department of Chemistry, University of Pretoria, Private Bag X20, Hatfield 0028, South Africa; henrietta.langmi@up.ac.za
 - ⁴ Energy and Fuels for a Sustainable Environment Team, Institut de Chimie et Procédés pour l’Energie, l’Environnement et la Santé, UMR 7515 CNRS–ECPM, Université de Strasbourg, 25 rue Becquerel, 67087 Strasbourg Cedex 2 France; blouis@unistra.fr (B.L.); parkhomenko@unistra.fr (K.P.)
- * Correspondence: nmusyoka@csir.co.za; Tel.: +27-12-841-4806

Citation: Duma, Z.G.; Dyosiba, X.; Moma, J.; Langmi, H.W.; Louis, B.; Parkhomenko, K.; Musyoka, N.M. Thermocatalytic Hydrogenation of CO₂ to Methanol Using Cu-ZnO Bimetallic Catalysts Supported on Metal–Organic Frameworks. *Catalysts* **2022**, *12*, 401. <https://doi.org/10.3390/catal12040401>

Academic Editor: Vincenzo Vaiano

Received: 4 March 2022

Accepted: 30 March 2022

Published: 5 April 2022

Publisher’s Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

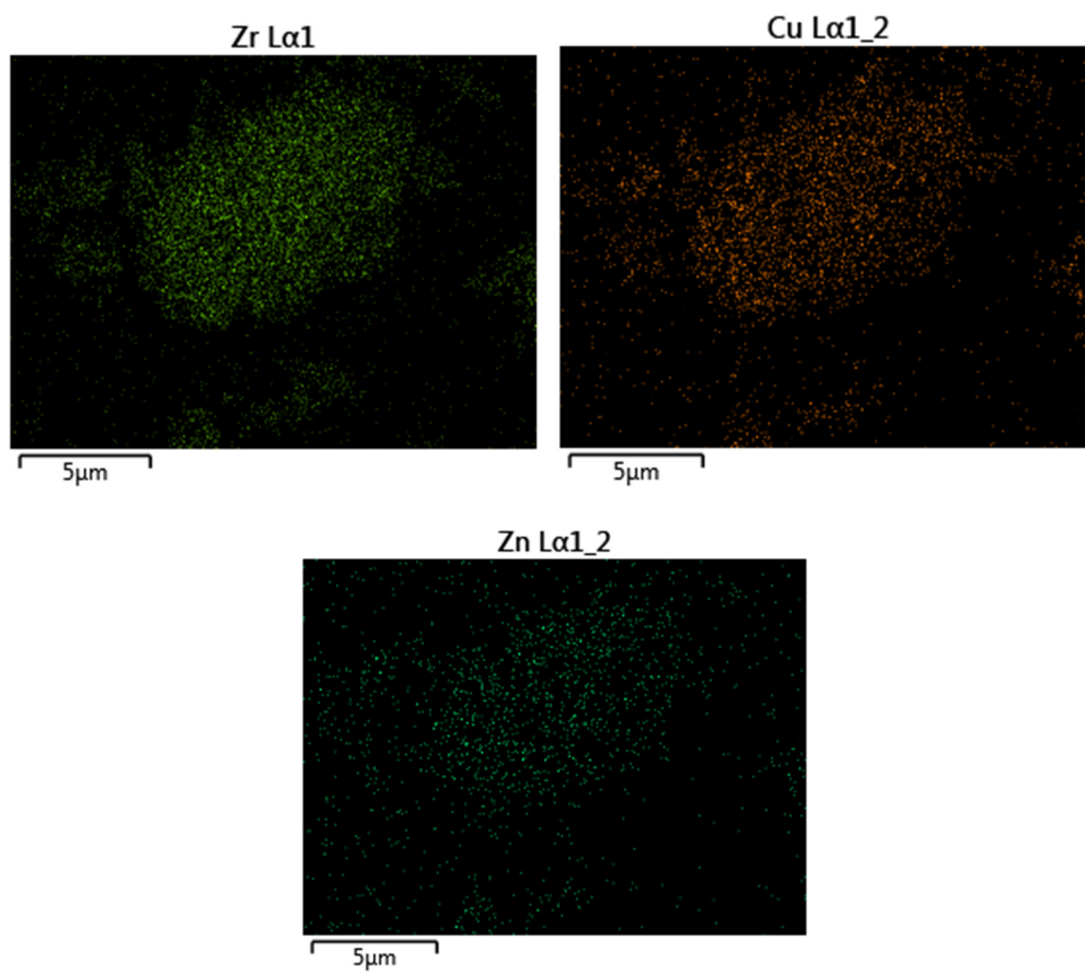


Figure S1. Elemental maps of Cu/ZnO/UiO-66.

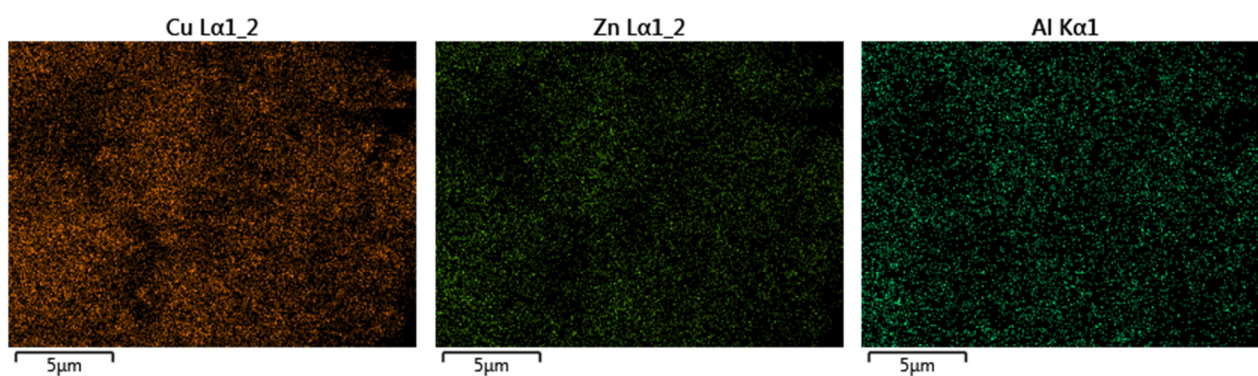


Figure S2. Elemental maps of Cu/ZnO/Al₂O₃/MgO catalyst.

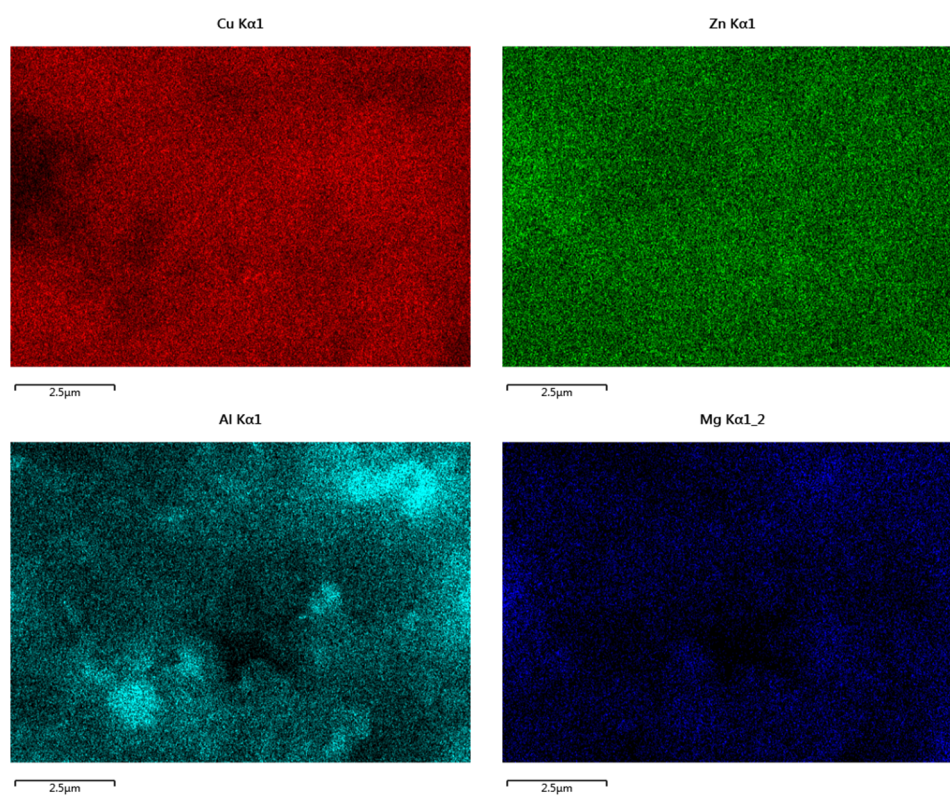


Figure S3. Elemental maps of commercial catalyst.

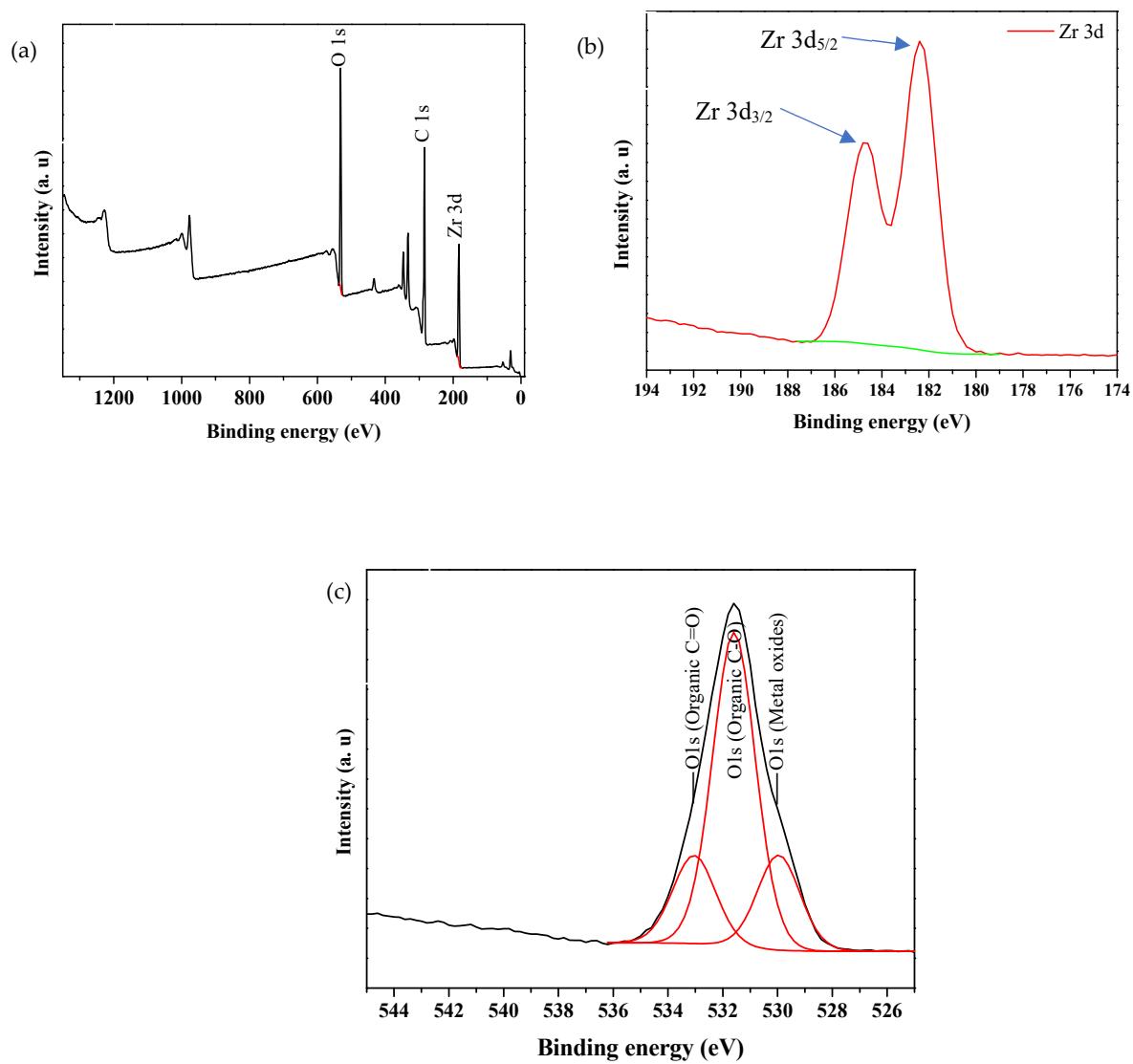


Figure S4. XPS results of UiO-66. (a) Full survey, (b) Zr3d, and O1s scan.