

UNALOME WETWATANA HARTLEY, Ph.D., DIC.

Associate Professor of Chemical Engineering

AREA OF RESEARCH INTEREST

CO₂ and N₂O utilization to energy and chemicals i.e. DMC, DEC, methanol; Inorganic membrane technologies; Process Intensification; Engineering of catalytic processes and petrochemical reactions; Development of new catalysts; Experimental and simulated research of environmentally-friendly alternative energy methods including hydrogen and syngas production; 4 ways catalytic converter for PM 2.5 abatement; Thermochemical cycles processes; Catalysts production from industrial wastes; Sustainable catalysts for clean-combustion.

SELECTED PUBLICATION

- Chalempol Khajonvittayakul, Vut Tongnan, Suksun Amornraksa, Navadol Laosiripojana, Matthew Hartley, Unalome Wetwatana Hartley, CO₂ Hydrogenation to Synthetic Natural Gas over Ni, Fe and Co-Based CeO₂-Cr₂O₃, *Catalysts* 2021, 11(10), 1159; <https://doi.org/10.3390/catal11101159>
- Murugesan Praveen Kumar, Govindhasamy Murugadoss, Ramalinga Viswanathan Mangalaraja, Prabhakarn Arunachalam, Manavalan Rajesh Kumar, Unalome Wetwatana Hartley, Sunitha Salla, Jothi Ramalingam Rajabathar, Zeid A.AL. Othman, Murefah mana AL-Anazy, Design and development of defect rich titania nanostructure for efficient electrocatalyst for hydrogen evolution reaction in an acidic electrolyte, *Journal of Materials Research and Technology*, doi.org/10.1016/j.jmrt.2021.07.119, In press, 8 August 2021
- Tatiya Khamhangdatepon, Thana Sornchamni, Nuchanart Siri-Nguan, Navadol Laosiripojana, Unalome Wetwatana Hartley, A Dual Reactor for Isothermal Thermochemical Cycles of H₂O/CO₂ Co-Splitting Using La_{0.3}Sr_{0.7}Co_{0.7}Fe_{0.3}O₃ as an Oxygen Carrier, *Processes* 2021, 9(6), 1018; <https://doi.org/10.3390/pr9061018>
- Chalempol Khajonvittayakul, Vut Tongnan, Netiwat Namon, Chutamat Phonbubpha, Navadol Laosiripojana, Matthew Hartley, Unalome Wetwatana Hartley, "Tar steam reforming for synthesis gas production over Ni-based on ceria/zirconia and La_{0.3}Sr_{0.7}Co_{0.7}Fe_{0.3}O₃ in a packed-bed reactor", *Chemosphere*, Volume 277, August 2021, 130280
- P. Saychu, M. Thanasiriruk, C. Khajonvittayakul, R. Viratikul, V. Tongnan, M. M. Hartley, S. Wongsakulphasatch, N. Laosiripojana, U.W. Hartley, "Catalytic Performance of Na-Mn₂O₃ based Catalysts towards Oxidative Coupling of Methane", *Catalysis Today*, Accepted 2 December 2020, In Progress.
- C. Wongsartsai, V. Tongnan, T. Sornchamni, N. Siri-nguan, N. Laosiripojana, M. Hartley, U.W. Hartley, "CO₂ Utilization via Methanation using 40%Ni/Ce_xCr_{1-x}O₂ as a Novel Catalyst: Comparative study of packed-bed and micro-channel reactors", *Reaction Kinetics, Mechanisms and Catalysis*, 131, (2020) 101–117, doi.org/10.1007/s11144-020-01853-1
- Tatiya Khamhangdatepon, Vut Tongnan, Matthew Hartley, Thana Sornchamni, Nuchanart Siri-Nguan, Navadol Laosiripojana, Kang Li, Unalome Wetwatana Hartley, "Mechanisms of Synthesis Gas Production via Thermochemical Cycles over La_{0.3}Sr_{0.7}Co_{0.7}Fe_{0.3}O₃", *International Journal of Hydrogen Energy*, accepted 21 July 2020, doi.org/10.1016/j.ijhydene.2019.12.148
- Nonchanok Ngoenthong, Vut Tongnan, Thana Sornchamni, Nuchanart Siri-nguan, N. Laosiripojana, Unalome Wetwatana Hartley, "Application of a Micro-Channel Reactor for Process Intensification in High Purity Syngas Production via H₂O/CO₂ co-splitting", *International Journal of Hydrogen Energy*, accepted 30 Nov 2019, <https://doi.org/10.1016/j.ijhydene.2019.11.240>
- A. Ngoensawat, V. Tongnan, N. Laosiripojana, P. Kim-Lohsoontorn, U.W. Hartley, "Effect of La and Gd substitution in BaFeO_{3-δ} perovskite structure on its catalytic performance for thermochemical water splitting", *Catalysis Communications*, In Press, Available online 9 December 2019, 105901, DOI: <https://doi.org/10.1016/j.catcom.2019.105901>

- Nonchanok Ngoenthong, Matthew Hartley, Thana Sornchamni, Nuchanart Siri-nguan, Navadol Laosiripojana, Unalome Wetwatana Hartley, "Comparison of Packed-Bed and Micro-Channel Reactors for Hydrogen Production via Thermochemical Cycles of Water Splitting in the Presence of Ceria-Based Catalysts", *Processes* 2019, 7, 767; doi:10.3390/pr7100767
- C. Khajonvittayakul, V. Tongnan, T. Kangsadan, N. Laosiripojana, S. Jindasuwan, U. W. Hartley, "Thermodynamic and mechanism study of syngas production via integration of nitrous oxide decomposition and methane partial oxidation in the presence of 10%NiO–La_{0.3}Sr_{0.7}Co_{0.7}Fe_{0.3}O_{3-δ}", *Reaction Kinetics, Mechanisms and Catalysis*, 2019, Volume 127, Issue 2, pp 839–855, DOI: <https://doi.org/10.1007/s11144-019-01600-1>
- J. Sarabut, S. Charojrochkul, T. Sornchamni, N. Laosiripojana, S. Assabumrungrat, U. Wetwattana-Hartely, P. Kim-Lohsoontorn, "Effect of strontium and zirconium doped barium cerate on the performance of proton ceramic electrolyser cell for syngas production from carbon dioxide and steam, *International Journal of Hydrogen Energy*, Volume 44, Issue 37, 2 August 2019, Pages 20634–20640, <https://doi.org/10.1016/j.ijhydene.2018.07.121>
- Tao Li, tatiya Kamhangdatepon, Bo Wang, Unalome Wetwatana Hartley, Kang Li, "New bio-inspired design for high-performance and highly robust La_{0.6}Sr_{0.4}Co_{0.2}Fe_{0.8}O_{3-δ} membranes for oxygen permeation", *Journal of Membrane Science*, 578 (2019), 203–208
- Skonrach Thongkumkoon, Worapon Kiatkittipong, Unalome Wetwatana Hartley, Navadol Laosiripojana, Pornlada Daorattanachai, Catalytic activity of trimetallic sulfided Re-Ni-Mo/Al₂O₃ toward deoxygenation of palm feedstocks, *Renewable Energy*, 140 (2019), 111–123,
- Tongnan, V., Sornchamni, T., Laosiripojana, Hartley. U.W., "Study of crystal growth and kinetic parameters of Zn/ZnO oxidation in the presence of H₂O and CO₂", *Reac Kinet Mech Cat*, 125 (2018), 99–110
- T. Li, M.F. Rabuni, L. Kleiminger, B. Wang, G.H. Kelsall, U.W.Hartley and K. Li, "A highly-robust solid oxide fuel cell (SOFC): simultaneous greenhouse gas treatment and clean energy generation", *Energy & Environmental Science*, 9 (2016), 3682–3686
- Unalome Wetwatana Hartley, Suksun Amornraksa, Pattaraporn Kim-Lohsoontorn, Navadol Laosiripojana, "Thermodynamic analysis and experimental study of hydrogen production from oxidative reforming of n-butanol", *Chemical Engineering Journal*, 278 (2015) 2–12

RECENT PROFESSIONAL SERVICE

- Invited speaker at COP26@ Lancaster University Festival on Mitigating Climate Change Through CO₂ Capture and Utilization Technologies, 20th-22nd October 2021, Lancaster University, England
- Invited speaker at Royal Academy of Engineering (RAEng, UK) on a conference entitled "Problem Based Learning: Teaching Engineers to Tackle the SDG", 3rd-4th March 2020, Prince Philip House, London, England
- Visiting academic at Imperial College London, 2018 and 2016
- Organizing committee of "The 8th Asia Pacific Congress on Catalysis, August 4-7th, 2019, Bangkok, Thailand (APCAT-8)".
- Scientific committee of "1st EuroAsia Conference on CO₂ capture and utilization", August 6-7th, 2019, Sunway University, Selangor Darul Ehsan, Malaysia

RECENT FUNDING

Principle Investigator for around 25 projects (industrial and government fund, from Thailand and England) with total funding estimated at around 1.2 million euros. Examples of funds are;

- A novel electrochemical reactor for direct synthesis of renewable CH₄ from CO₂, Newton Fund, Royal Academy of Engineering (RAEng), England (24 months, 2020)
- Direct Synthesis of Diethyl Carbonate (DEC) from CO₂ and Ethanol in a H₂O permeated membrane reactor, National Research Council of Thailand (NRCT), Thailand (36 months, 2021)
- PM 2.5 Abatement: by improving the performance of exhaust pollutant removal process of diesel engine using a four-way catalytic converter process, Thailand Science Research and Innovation (TSRI), Thailand (12 months, 2021)
- From wastes to catalysts: Catalyst development and production for clean technology, funded by Thailand Science Research and Innovation (TSRI), National Research Council of Thailand (NRCT) and E.H. consultants LTD (18 months, 2020)
- CO₂ Utilization: Advanced membrane technology in clean DMC production, funded by Royal Academy of Engineering (England) and SCG (2 years, 2019-2021)

NATIONAL PATENTS

- 1901001257, กรรมวิธีการเตรียมตัวเร่งปฏิกิริยานิกเกิลบนสารประกอบออกไซด์ของซีเรียมและโครเมียม (Ni-Ce/Cr) และการนำไปใช้ในปฏิกิริยามีเทนเนชั่นจากก๊าซคาร์บอนไดออกไซด์
- 1903001261, ตัวเร่งปฏิกิริยาในกระบวนการผลิตก๊าซสังเคราะห์ โดยผ่านกระบวนการเทอร์โมเคมีคอลไฮเดิล
- 1901001667, ตัวเร่งปฏิกิริยานิคโลหะออกไซด์ผสมสำหรับเตาเผาชีวมวล
- 2003001952, กรรมวิธีการเตรียมตัวเร่งปฏิกิริยานิคโอไซด์ผสมแมงกานีสออกไซด์บนตัวรองรับซิลิกอนไดออกไซด์ (NaCl-Mn₂O₃/SiO₂) และบนตัวรองรับซิลิกอนคาร์ไบด์ (NaCl-Mn₂O₃/SiC) สำหรับนำไปใช้ประโยชน์ในกระบวนการออกซิเดทีฟกลับปลิงมีเทน