Thomas F Jaramillo, Biosens J 2018, Volume 7
DOI: 10.4172/2090-4967-C1-002

4th International Conference on **Electrochemistry**
June 11-12, 2018 | Rome, Italy

Design and development of catalyst materials for the production of fuels and chemicals in a sustainable manner

Thomas F Jaramillo[1, 2, 3]
[1]Stanford University, USA
[2]SUNCAT Center for Interface Science and Catalysis, USA
[3]SLAC National Accelerator Laboratory, USA

Statement of the Problem: The vast majority of fuels and chemicals that are produced and consumed across the globe today are derived from fossil fuels: oil, coal, and natural gas. The long list includes conventional liquid fuels such as gasoline, diesel, and jet fuel, in addition to many other products such as plastics (e.g. polyethylene) and fertilizer (i.e. ammonia, NH_3). Society has benefitted tremendously from the science and engineering efforts that have brought these crucial products to market at a global scale, however continuing to use fossil-based resources at such high rates could potentially lead to troubling consequences ahead. This motivates the development of new chemical processes to produce the same kinds of fuels and chemicals that we rely on, using renewable energy and sustainable feedstocks instead.

Methodology & Theoretical Orientation: We seek to employ solar and wind energy to power the production of fuels and chemicals in a sustainable manner, largely motivated by the dropping costs of renewable electricity, the growing penetration of renewables into energy markets, and the need for storing variable electricity.

Findings: Catalyst materials have been developed capable of driving important chemical transformations in a sustainable manner involving electricity. Specific examples include the production of hydrogen (H_2), carbon-based products (e.g. hydrocarbons, alcohols), ammonia (NH_3) fertilizer, and hydrogen peroxide (H_2O_2).

Conclusion & Significance: The development of catalysts with appropriate properties can serve as the basis of new, renewable pathways to produce the large-scale fuels and chemicals that could play a major role in reaching sustainability goals for the globe.

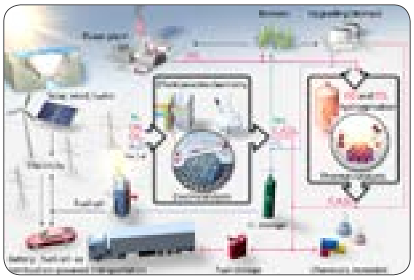

Figure 1: The development of improved catalysts can enable new processes for the sustainable production of fuels and chemicals.

Recent Publications

1. Z W Seh, J Kibsgaard, C F Dickens, I Chorkendorff, J K Nørskov and T F Jaramillo (2017) Science 355:6321.
2. J W D Ng, T R Hellstern, J Kibsgaard, A C Hinckley, J D Benck and T F Jaramillo (2015) ChemSusChem 8:3512-3519.
3. C Hahn, T Hatsukade, Y G Kim, A Vailionis, J H Baricuatro, D C Higgins, S A Nitopi, M P Soriaga and T F Jaramillo (2017) Proc. Nat. Adad. Sci., 114:5918–5923.
4. J M McEnaney, A R Singh, J A Schwalbe, J Kibsgaard, J C Lin, M Cargnello, T F Jaramillo, and J K Nørskov (2017) Energy Environ. Sci, 10:1621-1630.
5. Z Chen, S Chen, S Siahrostami, P Chakthranont, C Hahn, D Nordlund, S Dimosthenis, J K Nørskov, Z Bao and T F Jaramillo (2017) Reaction Chemistry & Engineering, 2:239-245.

Biography

Thomas F Jaramillo is an Associate Professor of Chemical Engineering at Stanford University and the Deputy Director of Experiments at the SUNCAT Center for Interface Science and Catalysis, a partnership between the School of Engineering at Stanford and the SLAC National Accelerator Laboratory. He earned his BS in Chemical Engineering at Stanford, followed by MS and PhD degrees in Chemical Engineering from the University of California at Santa Barbara. He then conducted research at the Technical University of Denmark as a Hans Christian Ørsted Postdoctoral Fellow prior to joining Stanford's Faculty in 2007. His research efforts are aimed at developing materials and processes for sustainable chemical transformations related to energy conversion. He has earned a number of honors and awards for his efforts, including the Presidential Early Career Award for Scientists & Engineers (PECASE, 2011).

jaramillo@stanford.edu

Notes: