Supplementary Information:

Light Assisted Hydrogen Production from Formic Acid Using Palladium Catalysts

Tarek M Abdel-Fattah[1], Erik Biehler[1], Michelle A. Smeaton,[2] Thomas Gennett,[3], Noemi Leick [2]*

[1] Department of Molecular Biology and Chemistry, Christopher Newport University, 1 Avenue of the Arts, Newport News, Virginia 23606, United States

[2] National Renewable Energy Laboratory, Golden, Colorado 80401, United States

[3]Chemistry Department, Colorado School of Mines, Golden, Colorado 80401, United States

• Corresponding Author Email: fattah@cnu.edu

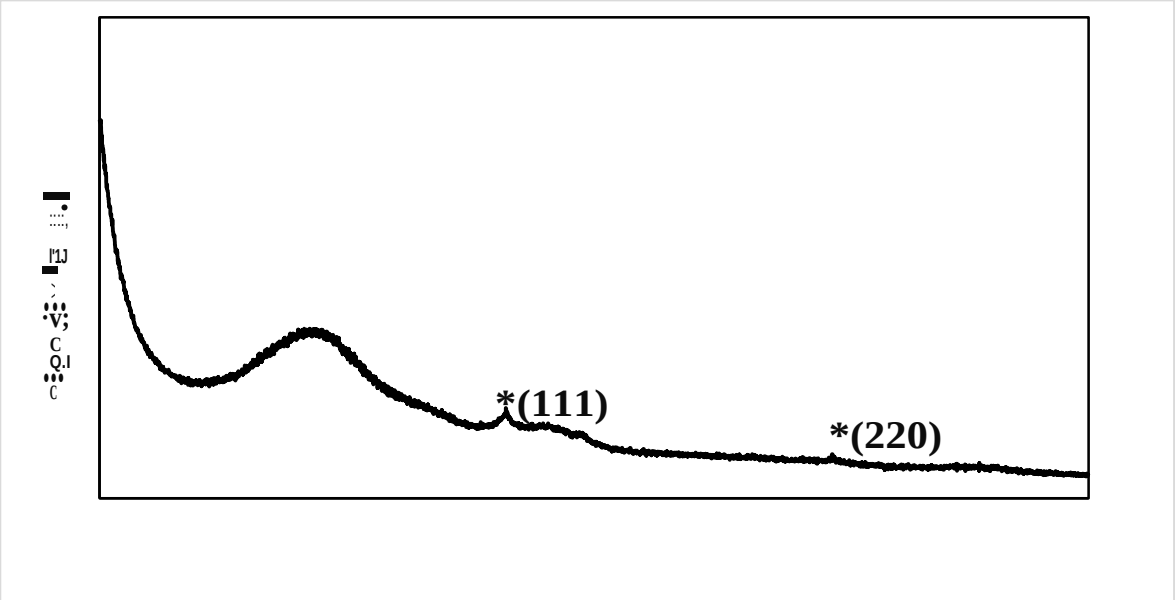


Figure S1. P-XRD analysis of Pd/C sample conducted with Cu Ka radiation in the 28 range of 5-90°. Asterisks highlight the major peaks characteristic of the face centered cubic structure of palladium.

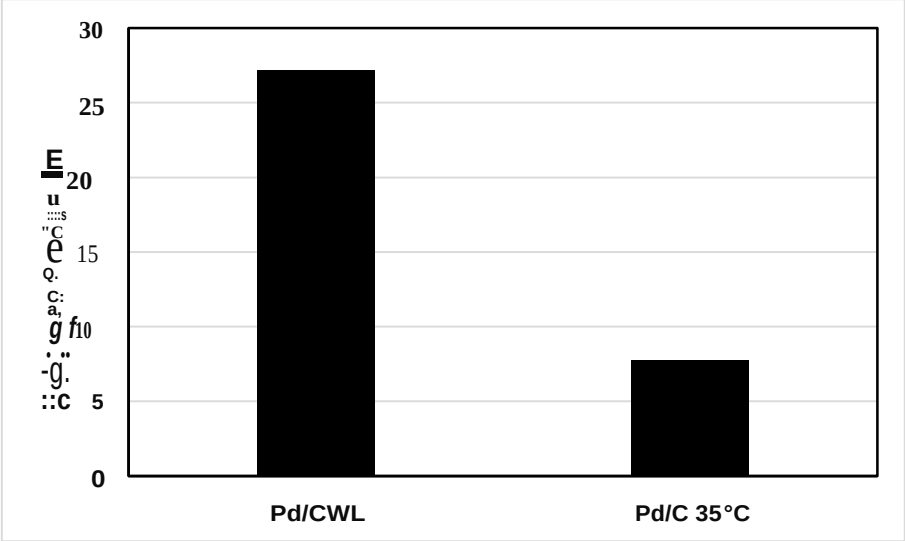


Figure S2. Photo-induced gas evolution from FA using a white light (WL) source under the conditions described above compared to thermally activated catalysis at 35 °C.

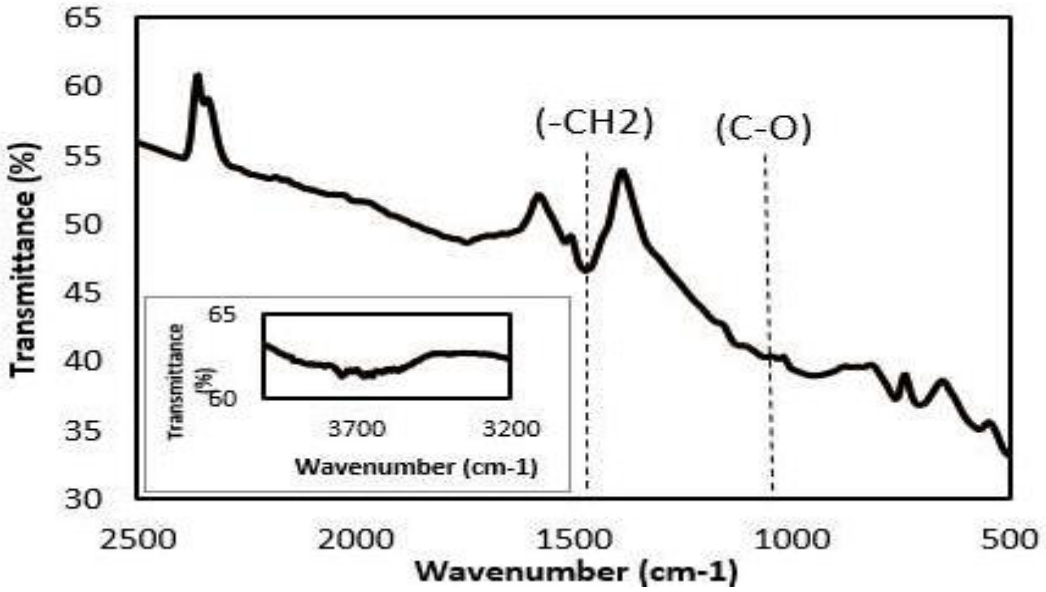


Figure S3. **FTIR analysis of the Pd/C sample.**

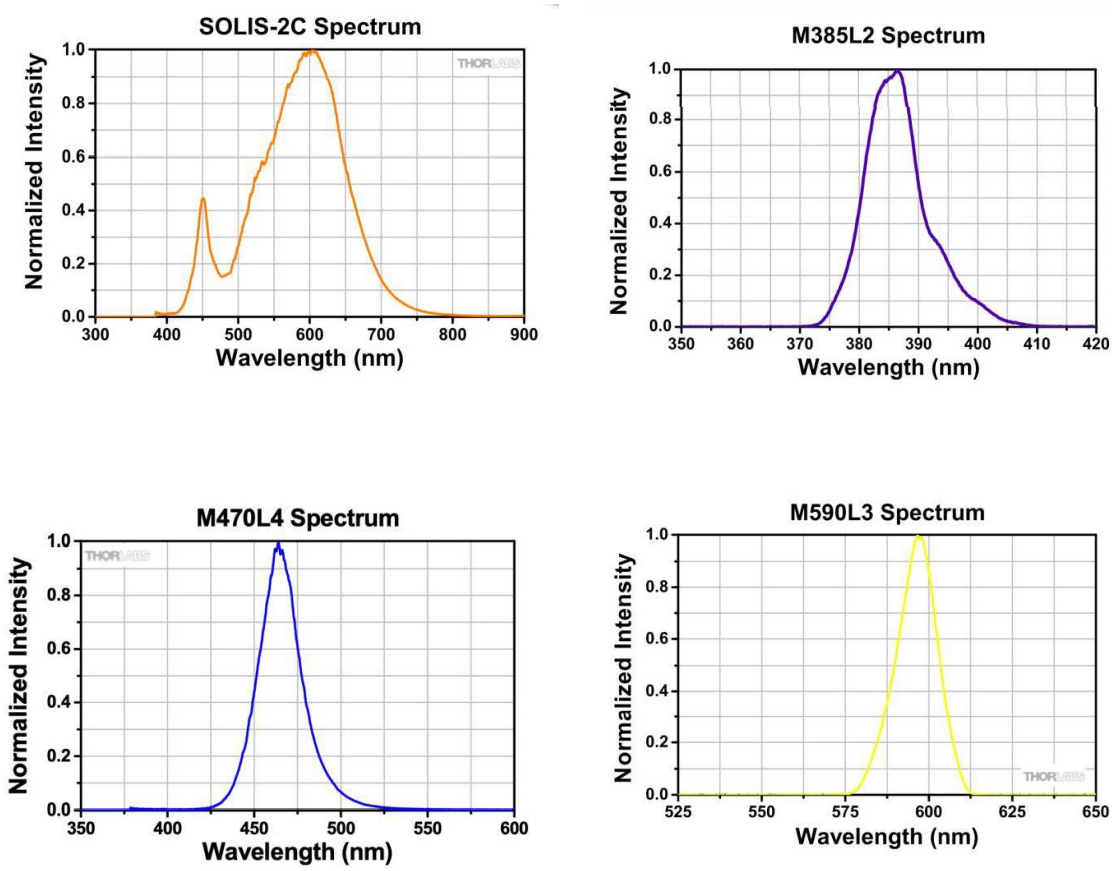


Figure S4: Normalized intensity of the different LED from Thorlabs used in this study with their reported maximum irradiances measured at a distance of20 cm without any focusing or collimating optics.

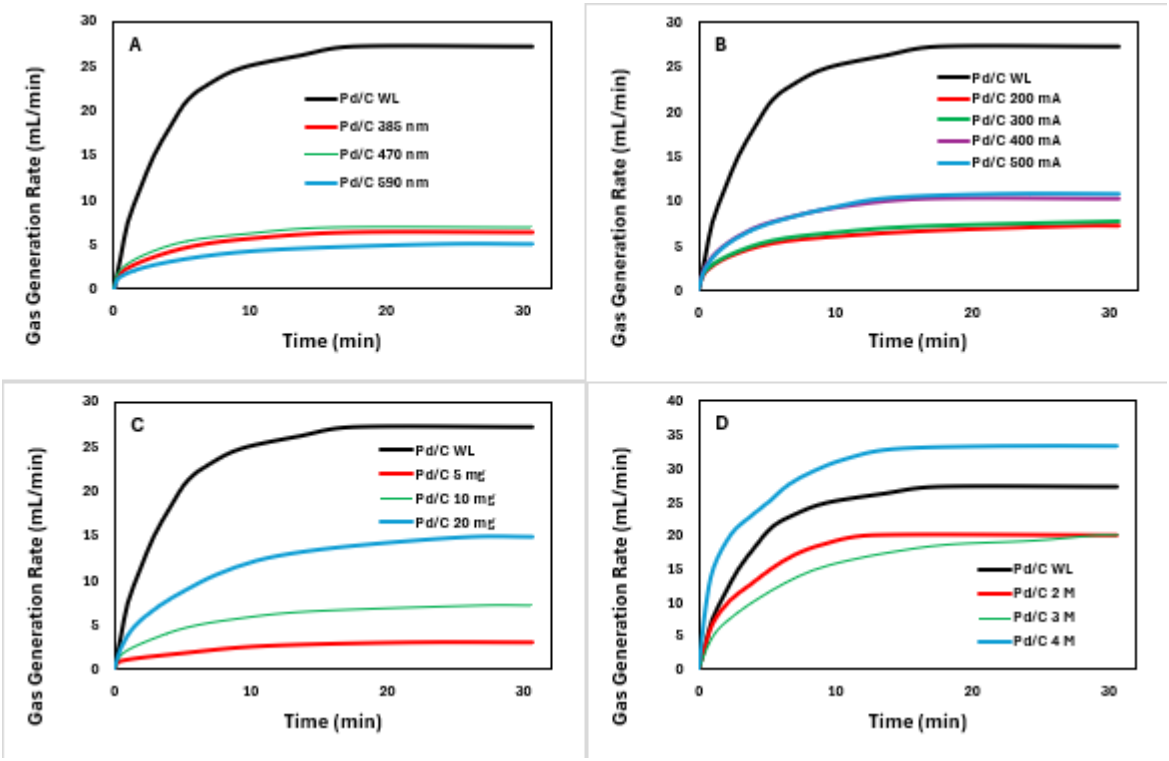


Figure S5. Gas generated from the photo-induced dehydrogenation of FA. **A.** White light (WL) vs. monochromatic LEDs Pd/C catalyst. **B.** WL adjusted to different input current, reaching different irradiances, where WL represents the maximum set current in this study, 1,000 mA. **C.** Mass of the Pd/C catalyst was changed, while the amount of FA was kept constant. **D.** FA concentration was changed for a constant liquid volume and mass of Pd/C catalyst.

Table S1. Reusability study for Pd/C catalyst.

Trial Number	**Volume of Gas Generated (mL)**
1	331.076
2	74.907
3	43.1484
4	19.4888

Table S2

Surface Area and Pore size information forPd/C Catalyst

Sample	**S_{BET} (m^2/g)3**	**V_t (cm^3/g)[b]**
Pd/C	1453.76 ± 7.08	1.49

[a] Ss ET (BET surface areas).

[b] Vt (total pore volume was estimated at a relative pressure of *P/Po=0.990.*