

## Diverse Catalytic Hydrogenation Reactions Without Need for External, Compressed Hydrogen Gas



**Project Outcome.** Catalytic hydrogenation reactions are of exceptional importance in a wide range of settings, from academic research to industrial applications. Such reactions are capable of converting one structural element to another in organic molecules, and these are critical to the development of any new compound. However, catalytic hydrogenation reactions, which typically require carbon-supported palladium metal and hydrogen gas, are not without cost and hazard issues. Primarily, hydrogen gas, necessary for these reactions is obtained from compressed gas cylinders. These cylinders of stored hydrogen pose a severe hazard and there are associated costs for the production of compressed gas. Our research has led to a method for diverse catalytic hydrogenations *without need for external, stored hydrogen gas*.

**Impacts & Benefits.** Because catalytic hydrogenations are one of the most common transformations in the chemical manipulations of organic compounds, the utility of the chemistry is anticipated to be very broad, in both academic and industrial settings. Besides, the reaction is not limited to a particular type of transformation but is applicable in a number of contexts. These hydrogenation reactions rely on stable and generally moisture insensitive materials (the components are indicated within the gears in the picture to the left). This means that the use is not limited to experienced practitioners but those with modest training can utilize it. Most critically, the method eschews dependence of and access to stored compressed hydrogen gas and removes a potential major hazard.

**Background & Explanation.** This collaborative research between the groups of Professors Mahesh Lakshman and Barbara Zajc (funded by NSF CHE-1265687 and CHE-1565754, respectively) was carried out at The City College of New York, an ethnically diverse institution, with a large minority student population. NSF funding has been and remains critical to the PIs' abilities to train students of diverse ethnicities and educational levels, to better prepare them for further studies or careers. This research was fertile training ground for *four* Ph.D. students (*three* female), *two* MS students (*one* female), and *one* post-doctoral associate. All collaborated and contributed extensively to the research.