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Op-Ed Prototype 1

Major Research without the Major Price Tag

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Automated catalysis is a limited research area under the tight funding of labs worldwide with the current technology. Automated heterogeneous catalysis is an important field that is relied upon for selective processes that have major implications in the energy industry. Reduced carbon emission with the use of more advanced catalysts also offers major improvements to the climate crisis that we are facing worldwide. Automated catalysis is the characterization of catalysts using machinery and software that make the physical process hands-free. The goal is to identify important metrics of a catalyst to be able to apply the optimal one to your process. The current technology in place for automated catalysis has a very high capital cost that is difficult to justify for many smaller laboratories and research groups. The development of a method to use gas chromatograms as a reliable alternative for automated catalysis allows for limited funded labs to take part in research otherwise unfeasible.

The current automated catalysis machinery comes with a high capital cost that makes it very difficult for most research groups to participate. The machines such as the Micromeritics ASAP 2020 Automatic Chemisorption Analyzer or the Quantachrome Autosorb cost ~$70k as seen from a pricing quote from Micromeritics. A study from Lab Manager Magazine broke down the average budgeting for five different categories of labs. The $70,000 thresholds are above the instruments budget for academic and government laboratories by a substantial amount. Academic laboratories are a big draw for this type of research and given a total budget of just over $100k for the lab, an instrument of this price is a tall task. A specific alternative is gas chromatography, which can be used to mimic the expensive machinery when pair with chemstation software. This software is relatively cheap on the basis of lab equipment and is really straightforward to use. Gas Chromatograms are a reasonable alternative as they are able to use a 6 port valve to mimic the pulsing of chemisorption machines. Gas chromatograms are much cheaper around $10-15K and also are found in almost every lab worldwide. The understanding needed to complete these trials is also trivial with the understanding of gas chromatography. Developing a method for a gas chromatogram will open up the opportunity for many smaller research groups or academic labs to take part in this type of research, propelling the field exponentially.

An added benefit of the gas chromatograms paired with chem station software is the ability to work remotely. A study by McKinsey & Company stated that 20% of the current workforce could be able to work remotely, allowing for an increase of 12 workers in research-related companies per average company. With the current climate of the world pandemic, having the ability to work remotely offers for a safer work environment, but also could allow for smaller labs to take on extra researchers. Pushing physical resources with added researchers to this field would introduce potential huge developments in the catalysis field. Advancements in the catalysis field are essential to furthering the chemical processing and energy fields as catalysts increase process selectivity, limiting the waste produced by these processes. Another benefit is the potential for inter-laboratory collaboration with remote access to data. Having this access could allow for multiple labs to work on the same experiments with only one lab needing to run the experiments which could save multiple small labs thousands. While extending the ability for remote research creates potential, the argument for added concerns will be discussed when budgeting is occurring for a lab.

The high cost of automated catalysis technology should not be a deterrent to smaller funded laboratories. The development of the automated catalysis field is essential to rectifying the chemical production and energy industries. The overwhelming price of technology can be mitigated by the use of gas chromatography paired with computer software to mimic the high-cost technology. Also, the remote availability of the software allows for the potential to increase the size of smaller labs to have more manpower available for research, while also creating a safe environment with the looming pandemic. Investing in research within the heterogeneous catalysis field is very feasible with the transition to the use of gas chromatograms. Limited budgets should not be a factor preventing great minds from joining the progress in heterogeneous catalysis. The advancements are essential for reducing the climate crisis we are currently facing, and reassessment of research resources can change our planet forever.

Feedback Request

1. What is the major argument or idea that you drew from the op-ed?
2. Do you feel that you have an understanding of the technical terms in the paper? Are there any terms that are unclear?
3. Are there any arguments that you felt were out of place or lacking in support?
4. Overall, did you find the paper interesting and worth the read?

Resources

1. *Frontiersin.org*. N.p., n.d. Web. 5 Oct. 2021.
2. Friend, Cynthia M., and Bingjun Xu. "Heterogeneous Catalysis: A Central Science for a Sustainable Future." *Accounts of chemical research* 50.3 (2017): 517–521.
3. I Will work on getting the source
4. Dittmer, Joerg, and Christi Bird. "The Third Annual Laboratory Spending Trends Report." *Labmanager.com*. Lab Manager Magazine, 6 Nov. 2013. Web. 5 Oct. 2021.
5. Madgavkar, Anu, James Manyika, and Sven Smit. "What's next for Remote Work: An Analysis of 2,000 Tasks, 800 Jobs, and Nine Countries." *Mckinsey.com*. McKinsey & Company, 19 Nov. 2020. Web. 5 Oct. 2021.