

A new approach to the sensible use of carbon dioxide from car exhaust gases

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Using impure CO₂ from car exhaust, the team of Prof. Dr. Shoubik Das, Chair of Organic Chemistry I at the University of Bayreuth, presents a cost-effective synthetic route for γ -lactams. γ -Lactam is an organic

chemical compound, which is an inhibitory neurotransmitter. This means that CO₂, which is frequently produced anyway, can be put to good use. Valuable chemicals and pharmaceuticals can be combined with this CO₂. The paper is [published](#) in the journal *Nature Communications*.

The paper, "Straightforward synthesis of functionalized γ -Lactams using impure CO₂ stream as the carbon source," discusses a new method for using CO₂, a common greenhouse gas, in the synthesis of valuable chemicals and pharmaceuticals.

"Traditional approaches have focused on using pure CO₂ gas, but we propose a novel idea that utilizes impure CO₂ streams, such as those from industrial flue gas or car exhaust gas," explains Prof. Dr. Shoubik Das, Chair of Organic Chemistry I at the University of Bayreuth.

"The main motivation behind this approach is to reduce the air pollution caused by the accumulation of CO₂ and the cost and energy associated with the purification of CO₂."

The paper introduces a specific application of this method for producing γ -lactams, which are essential components in various natural products and pharmaceuticals.

"We aim to streamline the synthesis of γ -lactams from readily available materials, like amines and alkenes, while using impure CO₂ as a [carbon source](#)," says Das.

The significance of this research lies in its potential to provide a more straightforward and sustainable way to produce valuable compounds from waste such as CO₂. The authors emphasize the environmental and economic benefits of their approach, making it a noteworthy contribution to the field of CO₂ utilization in [chemical synthesis](#).

With this new approach, Prof Das and his team want to develop a sustainable strategy to reduce [global warming](#) and air pollution caused by CO₂. The Bayreuth scientists Yuman Qin, Suman Pradhan, Rakesh Maitin and Shoubhik Das are hoping for three effects:

- **Environmental impact:** by using impure CO₂ streams, the process offers a more environmentally friendly way to use [exhaust gases](#), contributing to efforts to reduce greenhouse gas emissions.
- **Cost efficiency:** The approach aims to minimize the costs associated with the purification of CO₂, which could make the synthesis of important chemicals and drugs more cost-effective in the long term.
- **Pharmaceutical development:** The specific application of this method to produce γ -lactams, essential components of pharmaceuticals, suggests a simpler and more sustainable route to drug synthesis. This could have a downstream impact on the [pharmaceutical industry](#) and potentially lead to more accessible and affordable medicines.

This could benefit the [chemical](#) industry, environmental sciences and drug research. "A method has been discovered that uses impure CO₂ streams and enables a breakthrough in the [synthesis](#) of valuable chemicals and pharmaceuticals," says Prof. Das.

More information: Yuman Qin et al, Straightforward synthesis of functionalized γ -Lactams using impure CO₂ stream as the carbon source, *Nature Communications* (2023). [DOI: 10.1038/s41467-023-43289-w](#)

Provided by Bayreuth University

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