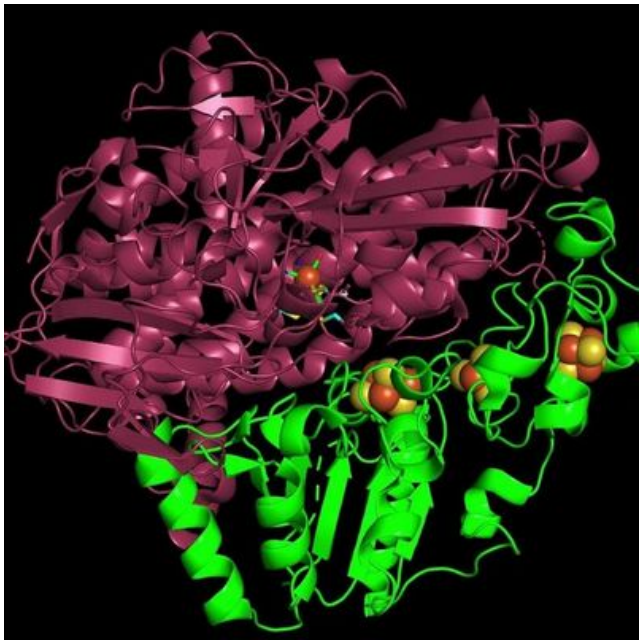
Interview: With Chemistry against climate crisis: „We need new materials and processes“

Start Time: Tuesday, December 20, 2022

End Time:



Climate-neutral fuels and materials made from CO_2 - physicist and UniSysCat group leader Maria Andrea Mroginski is researching for a sustainable future at the TU Berlin. She is convinced: catalysts have enormous potential for combating the climate crisis.

Please find the original interview (in German) published on December 14, 2022 in Riffreporter by Elena Matera: https://www.riffreporter.de/de/umwelt/klimawandel-klimakrise-umwelt-chemie-physik-katalyse-co2-kraftstoffe?purchase=success

How can we make a sustainable future possible? Maria With this question Andrea Mroginski deals in her daily work. The physics professor, UniSysCat group leader and head of the research group "Modelling of Biomolecular Systems" is looking for new, efficient catalysts at the TU Berlin. But what exactly are catalysts? Why are they important in the fight against the climate crisis? What can we learn from nature? And would a world without catalysis even be conceivable? A conversation.

Prof. Mroginski, you’re searching for new catalysts, that shall make our world more sustainable. What are catalysts anyway?

In Chinese language, the word catalyst also means matchmaker. And that explains it quite well.

Just as a matchmaker brings two people together and negotiates the conditions for this, a catalyst makes two chemical substances react with each other, which would not or hardly be possible without catalysts.

And why are catalysts so important?

Crucial processes such as photosynthesis, in which carbon dioxide and water are converted into sugar and oxygen under sunlight, only work with the help of catalysts. But biological catalysts in our bodies, i.e. enzymes, also control vital processes, for example our digestion, the energy metabolism of the cells, the copying of DNA. Without catalysts, there would be no life.

And you are specifically looking for efficient enzymes in your research?

Exactly. I am researching enzymes and try to understand how they work in order to develop improved, technically useful catalysts.

Can we learn from nature in this respect?

Nature's processes are highly efficient, and we as humans can learn a lot from it. However, we cannot adopt everything from nature one-to-one. We have to modify the enzymes we study for our own purposes. That is not quite so simple.

Are there enzymes that we already use in our daily life?

Yes, threre are quite some! For example, in washing detergents, we're using several enzymes, such as lipases. They break down fats even at low temperatures. Enzymes, such as lysozymes, are also used for food preservation.

What are you currently researching on?

I am looking at the production of formate. The chemical formate has many industrial applications in chemistry, food technology and the production of fuels. In the chemical industry, at the moment, it takes many steps to produce formate. We want to produce it in just one step, using hydrogen molecules and CO_2 from the atmosphere and the two enzymes, hydrogenase and formate dehydrogenase.

And how far have you got with your research?

It is not so easy to bring together two enzymes that do not interact with each other in nature. But I am confident that we will succeed with it.

How can catalysts help us to make our future more sustainable?

With the help of catalysts, we can make chemical production processes more efficient. This means enabling chemical reactions to take place with the least amount of energy, as is already being done in ours cars, in the pharmaceutical or in food industries, for example. We need less material and energy, there are fewer pollutants, lower CO_2 emissions, less waste. And: thanks to new catalysts, we can also convert CO_2, similar to photosynthesis.

How so?

The production of formate is a good example in this context. For its production we take CO_2 from the atmospere. We can then convert this CO_2 into synthetic fuels or new materials. Some colleagues here at the TU Berlin are doing research on such processes. In this way, the amount of CO_2 in the air can be reduced and integrated into the carbon cycle. There are so many possibilities. Catalysis has enormous potential.

What do you think about personal renunciation to stop the climate crisis?

We will not be able to influence climate change in the long term through bans. We can save electricity, travel less. But here's the thing: people come together from different countries thanks to international cooperation and industrial globalisation to efficiently manage scientific issues and care for people together. I myself come from Argentina and now work and live here in Berlin. It would be a step backwards if it were no longer possible to work together efficiently internationally in the future because mobility was outlawed or restricted by bans, for example because it was decided not to use synthetic fuels as a CO_2-neutral alternative.

And catalysts will be a crucial factor for stopping the climate crisis?

Instead of of renouncing, we need to develop new materials and processes so that we can significantly reduce our CO_2 emissions and maintain economic strength, as the foundation of society. We need to develop climate-neutral fuels so that automobiles, shipping and air transport become more sustainable. We must advance renewable technologies: Fuels from CO_2-free power generation, i.e. hydro, wind, solar and nuclear power. We need to produce such fuels, and convert them so that they can be stored. And for all that we need catalysts.

Is enough being invested in catalysis research?

There should actually be much more. We are working on topics that are important for the future, and the topic of synthetic fuels is only one of many. My research, in turn, is only a small part of this. There are many aspects and questions that revolve around catalysis that could be worked on in projects, medical methods and process engineering processes would benefit from

this. It is time that we paay more attention to this.

The interview has been conducted by Elena Matera.