Interview

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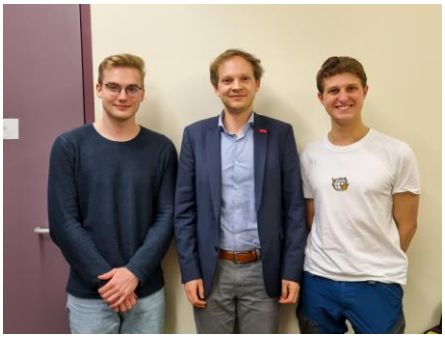

Question 1:

Why did you decide to use Cobalt as a catalyst and not something less toxic and more available, like iron?

Cobalt-based catalysts are neat in terms of literature and often stated issues with cobalt, like the supply chain, do not affect us in research. My feeling is that iron has more readily available oxidation states and is therefore somewhat less behaved and the iron complexes are less stable under irradiation then cobalt with the 3 well known oxidation states. Furthermore, cobalt has an interesting background looking for example at people trying to mimic bioematic reactions where cobalt works better than iron, I guess were not able to design ligands good enough to stabilize the intermediates with iron whereas cobalt is seemingly better behaved.

Question 2:

In one of your recent papers, you stated that a novel reaction of the Melchiorre group to photochemically functionalize pyridines with allylic radicals is probably unsuited for more complex olefines whilst your approach isn't. Why is that?

They have a slightly different tactic, not doing Hydrogen atom addition to an alkene or diene but rather abstract a Hydrogen atom in the allylic position of an alkene. And with an alkene in most cases having 2 allylic positions their catalyst is not necessarily able to distinguish between the two positions. In contrast the Hydrogen atom transfer along with the selectivity is fairly predictable as there are sterically and electronical reasons. Usually, the less sterically hindered side is attacked, but if they are similar, it will pick the more electron rich double bond of the diene.

Question 3:

How did you come up with the mechanism for the proposed reaction in the Paper "Light-Driven Cobalt Hydride Catalysed Hydroarylation of Styrene"?

It is about possible/plausible mechanism and taking a lot of knowledge of literature, in which you can find many different steps president, for example the reaction of [Co(salen^{tBu,tBu})] with protons will from Cobalt(III)-Hydrides is known in the literature. Also, that the Hantzsch Ester will form the strongly reductant excited state is president in the literature. Then we can check, the Cobalt(II) quenches the excited state of the Hantzsch Ester, that suggests that we see an electron transfer. So we can suggests we have Cobalt(II) going to Cobalt(I) and the most of the steps on the cycle you can rationalize though

the literature. At the end not all the mechanism that we write down are correct, but it is good for science to write something down, because at soon as you write something down you can disprove it. That's why it is important to read though the literature and to rationalize as much as you can.

Question 4:

Do you also use Stern-Volmer experiments to determine the mechanism?

We do; however, it is often hard. We use Hantzsch esters a lot and they are complex molecules in photochemistry. We have problems sometimes with Stern-Volmer where we don't always see what we think we will see, for example 1st order relationships. Different people have different opinions on how far you should go or how interesting it is to fully solve the mechanism, vs. now we have an idea about it, even when we don't always exactly know what is absorbing the light or so on, but I think it is still useful to put something down to paper.

Question 5:

Where do you see the photo redox catalysis in the industry in the future?

That's hard since I don´t work in industry. I only can rely on what other people say. People are pushing the bounds of how reducing or how oxidizing can we go in terms of reduction potentials or oxidation potentials. This would allow us to break stronger bonds potentially. This is interesting but what I think is most interesting is the selectivity, to use different tactics to control which bonds are broken and which are made. This then comes then together with the idea of merging the field of photo redox catalysis with other types of catalysis. This is one of the things my group does, looking at merging ideas of photo redox catalysis with metal catalysis, so you can discover new reactivities. How industry will use it, I don´t know. Every new method that goes into literature is available for people to use. Hopefully we are making their life easier. There will come a time, where the starting materials for fine chemicals changes. Looking at commercial small molecules organic starting materials they are still pretty much all crude oil derived. This will probably not change for a while, since it is such a tiny fraction of oils and therefore has to be the last thing that has to change. But ultimately it will change, and people want to use biomasses more as starting materials for fine chemicals.

Question 6:

In quite a few papers of yours, you state that the presented reaction can be used for drug synthesis. Is that something you deliberately research into or do you merely do it to show what the reaction is good for?

We currently do not look to make drug molecules often, though I think it is good, because it shows that the synthesis can be used in a somewhat more complex scenario. Of course, you can argue, what makes a molecule complex. I think there is a drive, for sure you see a change in the last decade, of functional group tolerance becoming more important and people wanting to show complex examples in their scope tables. You can have a long debate about what complex examples are, so bigger does not necessarily mean more complex, I would say. That is something often confused. When you generally think about organic synthesis, where do we have an impact? It is true, in material sciences,

in agrochemistry, but really, I think, what people directly associate with organic chemistry is you can make small molecule drugs. This is the most relatable application for a lot of people, and it is the easiest way for organic chemists to justify what we are doing. To ultimately say, look there may be applications for this so what we are doing is not a waste of time, because this is where it directly impacts humans. Currently we do not have links to industry or groups searching for this, but we like to try and show them, it is possible to introduce new groups in these types of molecules.

Question 7:

Why did you choose the academic way?

In between my bachelor and master I had the opportunity to do some research, like a summer internship, with a very enthusiastic, very knowledgeable postdoc, who then also oversaw my master thesis. He was really supportive. In university I wasn`t the person who did get the very top marks in the exams, but during research you can read all these papers and discover new things, and which is completely different to taking exams. For me this opened up a whole new world, which was very exciting. I really didn't have any industry experience. I didn't really know properly until midway through my Ph.D. that I wanted to stay in Academia. I like the freedom of being able to research what I want to know. I was always very lucky in my Ph.D. and my postdoc in which groups I worked. I also always enjoyed meeting so many different people and working at so many different places.

Question 8:

You just said that you like international groups. We know you have worked at many universities, did any of these spark interest especially or did you like any place so much that you want to go back there?

I think the best place I have been to in terms of living but also in terms of the group being super fun is Vienna. I mean it is an amazing city and I arrived there after my PhD, I think I was 26 or 27 and lived there for 2 years. The city is just amazing, and the quality of life is fantastic, so Vienna still holds a very special place for me. Whether I'd ever go back there is of course a different question, you know in academia you can't always choose where you go.

Question 9:

Shortly before you came to Braunschweig a research group leader, Phillip Klahn, departed to Gothenburg, because he had been offered a professor's position there, but not in Braunschweig. Do you by any chance know him?

Oh yes, so I don't know him directly, but I have of course heard of him. He left like a year ago, right? Yeah, but this is the German system. Very rarely you can stay where you did your PhD or built up your junior research group. Now there are more 10-year track positions, where it is clear there will be a permanent position in the end, but still this habilitation system exists here. This is just the way it goes.

Question 10:

What advice would you give a 1st semester chemistry student?

Interview

Be persistent and keep trying, never talk yourself out of applying. Be prepared of rejection because it is a part of being a scientist.

Thank you!