Field report for the Marshall Plan Scholarship

I started my research stay at the Lawrence Berkeley National Laboratory (LBNL) on February 12, 2020. After submitting the documents that I received upon my arrival in San Francisco, the admittance to the LBNL was granted very fast. A cubicle equipped with a computer and additional office supplies were reserved and ready to use upon my arrival. I was shown around and introduced to some colleagues. A kitchen with some cooking utilities and a copy room with additional office supplies were free for me to use.

The first few days of my stay I had to take care of some bureaucracy concerning my position as an affiliate of the LBNL. The LBNL itself is no university, but a research facility managed by the UC Berkeley yet officially an institution of the Department of Energy (DOE) of the US government. Therefore, issues like safety were and are taken very seriously. One full workday, I spent on completing online courses on safety concerning not only the specialized equipment that I would use at the beamline or in a laboratory, but also courses on ergonomics and how to safely climb a ladder.

From the start, my supervisor Martin Kunz and Andrew Doran, who I consider my co-supervisor, were extremely friendly, helpful and always available for any question I might have. They immediately invited me to several meetings of the various organizational levels at the Advanced Light Source (ALS). There was a meeting of the “Diffraction and Imaging” group, which was usually attended by up to ten people. In the framework of this meeting, I also gave a presentation about the research I conducted in Austria so far, especially with respect to the experiments I planned to perform at the ALS. Additionally, there was a meeting of the “Photon Science Department” and the so-called “All-to-All” meeting of the entire ALS. I was even introduced in the latter to the whole staff and felt very welcomed.

In the second week, we started with the redesign of the setup at the beamline 12.2.2 for in situ XRD studies in reactive gas atmospheres. Since the reaction I wanted to investigate, methanol steam reforming (MSR), involves condensable liquids in the gas phase as educts, there were problems with condensation and changes in the composition of the methanol/water mixture. We ordered the first parts and I started to construct the first model of the vaporization unit. While waiting for deliveries to arrive, they introduced me to the beamline and its components. They showed me how to control the beamline and evaluate the obtained data.

A lot of theoretical planning was necessary to find out, which parts to order. Parameters like diameter of the tubes, mixing of the gas phase, flow rate, chemical resistance of all parts, insulating properties of the containing walls and means of heating all had to be considered in advance, which slowed down the actual construction of the setup. Next to this, I also had to coordinate some measurements in Innsbruck that were necessary for a publication that we were about to submit and the evaluation of that data was also my responsibility. So time passed quickly and progress was made, until the shelter-in-place order was issued by the City of Berkeley in accordance with the Bay Area effective on March 16, 2020 due to the COVID-19 pandemic.

On Friday, March 13, we started a test series on the corrosion resistance of copper vs. brass in the relevant educts for MSR and we left for the weekend as usual. Then, my supervisor told me on Sunday to stay home on Monday as a precautionary measure due to the increasing concerns on COVID-19. On the next day, the shelter-in-place order was issued and the LBNL went into a standby mode with only approximately 200 people working on site instead of 4500 on a usual workday. I was able to go to the LBNL briefly to pick up my things and that was the last time it was possible for me to go on site in my entire research stay. Had this been clear at this point, it would have been a different situation and I would probably have tried to end my research stay prematurely.

However, the first shelter-in-place order was effective until April 7 and the beam time, the period I had to perform all of my experiments in, was scheduled for the last three weeks of April. But on March 31, the shelter-in-place order was extended until May 3. Due to the LBNL's numerous affiliations on the city, state and national level, they were very cautious and would not return to work on site while a shelter-in-place order is in effect. But there was still the possibility to get some beam time in May and I was really eager to perform these experiments as the last highlight of my PhD thesis.

Unfortunately, the order was extended once more on April 29 to May 31, which diminished the chances of conducting experiments even further. Still, I refused to give up hope and decided to stay, since it was theoretically possible to receive some beam time in June, even though the setup was not ready for the advanced experiments. But on May 18, the shelter-in-place order was modified to last indefinitely. After this decision, hopes were very slim to perform any experiments, so I just spent my time working on other publications.

Then, on May 26, the LBNL announced the phased reopening in so-called pilot phases with an incremental increase of people working on site. My supervisors suggested to write a proposal for a pilot project on how to conduct complex experiments with remote users. So we designed experiments with my samples in a framework that does not allow MSR, but still provides valuable information for my research. Due to their incredible commitment and willingness to help, Martin and Andrew managed to get approval for these experiments. I am very grateful for their help, but also Dula Parkinson, the head of the "Diffraction and Imaging" program, put a lot of effort into convincing the responsible people to approve my experiments.

Including preparation of the beamline and the actual experiments, the beam time lasted from June 22 to June 26. In this time, either Andrew or Martin was on site with me joining via Zoom. The experiments went well considering the circumstances. I could even actively participate by controlling parts of the beamline remotely, which I consider to be a valuable experience.

Although my research stay was overshadowed by the COVID-19 pandemic and the scientific output was smaller than anticipated, I appreciate the friendliness and helpfulness everyone showed me. The working atmosphere at the ALS was very safe and welcoming. The only thing that should be considered beforehand is the high cost of living in the Bay Area. With the Marshall Plan Scholarship alone, it is almost impossible to make it. I was lucky to still get paid during my stay by the project I am employed by in Innsbruck. Apart from that, I can only recommend the ALS and the LBNL for a research stay in the US. We will certainly continue the fruitful cooperation between the ALS and the Department of Physical Chemistry in Innsbruck in the future.