

Field Report

Fabrication and Physical Modeling of Nano-Scaled MoS₂ MOSFETs

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General Impression of Research Period Abroad

The research period abroad was a very intensive and at the same time educational and rewarding time. The six months I spent in the United States fall into the middle of my time as a PhD student. According to my experience, doctoral studies are characterized by a big extent of autonomy and personal responsibility. However, my time in the US set new standards in terms of autonomy, self-organization, freedom of choice and responsibility both on a professional and on a personal level. I had designed and written the research project all by myself, with only occasional feedback from my supervisors in Austria and in the US. This self-determined work style continued throughout my research stay. In this way I had the freedom to develop my own efficient working routines and set and readjust my own priorities constantly. In addition, I became more and more experienced in actively asking fellow PhD students as well as technical staff and faculty members for advice.

In general, I found a very productive working environment, with many highly motivated people and different work ethics compared to Austria. Most of the PhD students and many faculty members routinely came to campus on weekends and while all of them were working on their own projects they were readily available to answer questions or to help with problems if for example a machine did not work properly. One aspect of the American mentality that seems problematic to me is the strong focus on completely new ideas, on the so-called “giant leaps” and the focus on being “the first” at something. This creates an atmosphere of creativity and fast choices but bears the risk of abandoning good ideas too early and of severely underestimating the value of continuous progress. However, this aspect of the mentality is something that will stay with me as an experience. While I do not want to imitate this mentality in its completeness, I would like to adapt selected aspects like for example the higher readiness for taking risks which goes hand in hand with a higher readiness for failing.

As a balance to the competitive working climate, I was lucky to find a friendly guest family, an elderly, retired couple, with whom I stayed throughout the six months. In this way, I had always somebody to talk to and to join in for social activities outside university from time to time. The conversations at these events gave me a glimpse of American culture from a Mid-Western, rural perspective. In some respects, this world-view was entirely different from mine, while in others it showed how surprisingly similar the problems are that they were dealing with. Overall, I feel very grateful for staying with them as it gave me a solid anchor and source of support throughout my stay.

Quality of the Host Institution

The Discovery Park at Purdue University is a top-notch research institution. It is an interdisciplinary, shared-use facility where faculty from different departments (electrical engineering, mechanical engineering, materials engineering, physics, ...) bring their knowledge

and research equipment to the center they are associated with. Every center is dedicated to a specific interdisciplinary area, for example the group I was working with was part of the Birck Nanotechnology Center. This structure is different from the organizational structures I am used to at TU Wien where the separation of groups according to departments and institutes is stricter. In addition, also the offices of the graduate students are mixed, meaning that the students of one supervisor typically are distributed over different offices all over the building. This means that the colleagues who share the office with you most probably work on different topics which gives them a different perspective on the problems that you are facing daily.

Summing up, the Birck Nanotechnology Center offers high quality equipment and I benefitted from the knowledge exchange with faculty members and graduate students, which was not limited to students studying electrical engineering due to the special interdisciplinary structure. For graduate students in electrical engineering, Purdue University is a good place to be, which is reflected also by the national rankings of graduate programs, where the electrical engineering program at Purdue University ranked 12th in 2020. Worldwide it reaches rank 42, where TU Wien comes up at rank 101-150. Despite all the well justified criticism for university rankings, this ranking to some extent reflects my personal impression.

Integration in the Organization

The integration into the structures at Purdue University worked very well on all levels. As around a quarter of the student body at Purdue University are international students, the visa application process was handled very professionally, and I had all the support I needed to comply with government regulations. In addition, at the beginning of the semester in the middle of August Purdue University organizes a welcome week for international students where you can meet other students and local families. These events are organized very well and help to meet people from different parts of the organization. However, this event took place during the middle of my stay at Purdue, which is one of many examples for the fact that most of the official support from Purdue University was tailored to regular international students and not to visiting scholars like me. This meant that for most of the support I got, I relied on individuals like for example on a very friendly Building Logistics coordinator and on fellow PhD students who helped me with organizational questions. At Birck Nanotechnology Center, also a very active student network, the so called "Nanotechnology Student Advisory Council" organized many events where you can easily meet people and make friends.

Recommendations for Future Marshall Plan Fellows

Up front, your chances for a smooth start are highest, if you plan your stay in advance and keep in touch with all the people involved, informing your supervisors and colleagues at home and abroad regularly about your schedule. What worked well for me was to start the visa application process four months in advance and to organize the housing and the flight three months in advance.

Once you have arrived and settled at the host institution there are two pieces of advice that I would give. First, stay in touch with your supervisors at your host institution and abroad, for example by giving them updates every two weeks. Second, be flexible with regards to your goals and plans while always keeping the bigger picture in view. Small adjustments that are made to constantly adapt to the difficulties faced, help you achieve your long-term goals. Finally, I would advise you to participate in the programs and events that are organized at your institution. The connections you make to the people working and living at your host institution are essential for your time there and create precious memories.