

Final report

(Erasmus+ Internships – SMP)

Personal data and general information on the internship

Subject of studies: Materials Science

Course of studies: Master

Time of internship: 5 months

Place of internship: Grenoble, FR

„Internship title“:

Internship at the CEA of Grenoble on electrochemical study of Gallium Nitride for power electronic applications.



Figure 1 : CEA LETI logo

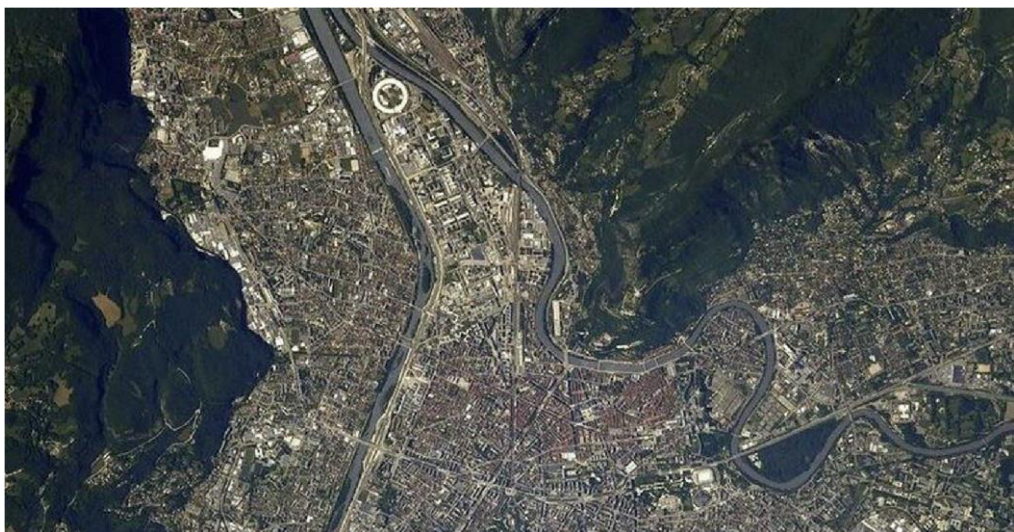


Figure 2 : Grenoble view by French Astronaut T. PESQUET

1. Planning and preparation

Thanks to an Erasmus Mundus track, the MaMaSELF program, I have decided to move abroad to realize my internship. This was a great chance to discover new regions, and to live for few months in a new place. Therefore, I succeed to get an internship at the French Commissariat à l'Énergie Atomique, the CEA. This research center is a worldwide well-known institution for its research's quality. Its main mission is to transfer technologies from research to companies, it is an applied research center. More specifically, I have been recruiting in the LETI department (picture below), focusing about microelectronic and microtechnology. The lab I worked in was the Laboratory of Materials for Photonic application (LMP).

My recruitment started with an interview with both supervisors. The recruitment process following this step has been quite long. Indeed because of confidentiality and defense, the HR department investigated my profile in order to allow my enrollment. This postponed my internship beginning to April 2021.

Following the confirmation of my internship, I had to prepare my departure to Grenoble quickly. I looked for an apartment thanks to a French website¹. I got this apartment quite easily. I travelled to Grenoble by car. My supervisor has been really helpful to my settlement in Grenoble. All the preparation process before my internship was satisfactory. I have been able to start my internship in good conditions.



Figure 3 : LETI's building

¹ « Le Bon Coin », be careful with it because of scam.

2. Internship

Throughout my internship, I focused about the electrochemical study of GaN semiconductor for electronic purposes. The aim of the project was to develop an innovative short loop technique in order to characterize defects induced by specific devices' manufacturing process (plasma-etching). I have been occupied every days for my internship, my project being so interesting in term of Science. For instance, my typical working day was to run experiments on the morning and to study the data on the afternoon. My supervisors were very kind, they gave me advices and helped me at each difficulties. We realized advancement meetings every two weeks. I learned a lot of things at CEA. That goes from theoretical knowledge in semiconductor and electrochemistry to new experimental measurements I ran. LETI's experts were very helpful and taught me new knowledges. Thanks to the environment I worked in, I discovered new technologies, devices' working principle or even new device's applications in microelectronic.

About my language skills, I succeed to improve my English specifically in deep scientific vocabulary.

3. Accommodation in the host country

I have found my accommodation on my own thanks to a French website. I did an interview with the landlord and everything worked well. My student apartment was really nice but a bit expensive. The reason of the high rent was because of the accommodation's location: in a nice neighborhood near Grenoble city center (called hyper center). I was concerned to find a nice neighborhood as the south of Grenoble cannot be so friendly every time.

4. Social interactions

I have discovered a great environment at LETI, in the LMP lab where I worked. The teams were really nice and I integrated them easily. Regarding the local community in Grenoble. I have discovered the city thanks to friends I met at the CEA. They were other interns who I met. We shared several moments as barbecues or beers after our working hours.

5. Everyday life and leisure

Grenoble's environment is very rich. The city is located between 3 mountains: Chartreuse, Vercors and Belledune. Thus, there is a lot of activities with hiking, running or climbing! Moreover, the city

is near Lyon, third biggest town in France and also close to “La Cote d’Azur” and the Mediterranean Sea. I have spent my free time exploring mountains, travelling on the weekend to Lyon, Nice or Cannes to meet friends. I went also to Italy once. I practiced football once a week with friends, my weekly routine was also to run few times.

Grenoble’s public transport is really efficient, made of buses and tramway. Tramway was my main and daily way to go to CEA.



Figure 4 : Grenoble city center

6. Financing (voluntary)

This Erasmus scholarship helped me considerably. My cost of living was close to the one in Munich, I would say about 1200€ per month. This amount takes into consideration my monthly cost of living, the rent and the charges. I received a salary during my internship, (700€) but the scholarship helped me pay my rent and it has been a huge advantage.

The rent of my accommodation was 590€/month. Moreover, the fixed charges with it were about 100€ per month. Thus, the total cost of my apartment was 690€.

Shopping was not so expensive and different supermarket are easily accessible. It is possible to use the tram to reach them, and several little grocery store can be found in Grenoble. Another

advice is to do your shopping in market which take place in the city center. There are really affordable, fruits and vegetables are fresh and that helps local farmer.

7. SINIK: Intercultural Seminar at the LMU

I have not attended an intercultural seminar at the LMU before the beginning of my internship.

8. Internship and studies

This is internship fitted perfectly with the professional project I am building. I have been able to use many knowledge in electrochemistry, semiconductor and plasma physic I got throughout my studies. Otherwise, thanks to several laboratory practice I realized at the LMU or earlier (XPS, electrochemistry measurement and set-up). Those knowledges have been very useful to start efficiently my master thesis.

This internship has been useful to discover the applied research environment. It has shown me the benefit and all the interest around applied research. I have loved to use the theoretical background I have and to apply it to useful technologies, still in development. I have seen direct links between deep physicochemical concepts and how they might be applied to improve our world and developed new technologies.

This internship has been a great experience, in a nice environment. I have worked with many nationalities, well-known experts at the state of the art in their fields. The environment at the CEA is rich and allows me to use highly precise characterization technique to drive my project.

This internship has driven me to continue with a PhD position, still at the CEA, in Bordeaux. I think that this internship has been an incredible experience and might lead me to opportunity in the future, starting with this PhD position. At first glance, I would like to start my career in an applied research environment: a research center like the CEA or a company's R&D department. This taste for applied research is directly linked with my winter semester at the LMU and this abroad internship.

9. Conclusion

My expectations have been all fulfilled by my internship. I have discovered a nice environment at the CEA where I integrated a high quality and friendly research group. Thanks to my supervisor I have been able to understand complex physicochemical system (semiconductor/electrochemistry), study it and use my knowledge got through my studies. Moreover, I have discovered a great city and region with Grenoble. The city is rich of diversity and the 3 mountains surrounding it allow a lot of activities. Finally, I met and exchanged with several nationalities, I created my scientific network throughout this internship and I know that I will keep in touch with a lot of people, either CEA's people or future scientist friends.

I faced no difficulties during this internship, or at least, I did not feel them. Slight difficulties where the thesis writing, which is never an easy exercise. However, I improved my skill doing it.

I would recommend without doubts the CEA of Grenoble for future interns. The place is ideal as there are a lot of opportunities as a student: meet scientific experts, use highly precise characterization equipment, use cleanroom facilities and work on a lot of diverse topics.

The CEA proposes a lot of internships every year. The offers are broadcasted through their website.

To conclude, I would like to thank the Studierendenservice Internationale Praktika. The scholarship they attributed me was a great help to complete this internship. I have been financially independent thanks to it.