

## TUHH CamPUS Placement 2022

### *Non-technical report*

*Reza Sair*

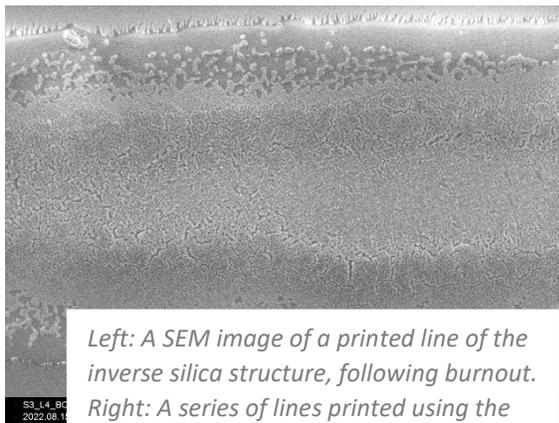
### *Jesus College, Cambridge*

Having completed my second year studying the three options of Materials sciences, physical Chemistry, and organic/inorganic Chemistry, I decided that I wanted to get a feel for what it would be like to continue with a career as a researcher as part of a university. As such, the CamPUS placement, provided the perfect opportunity to do this.

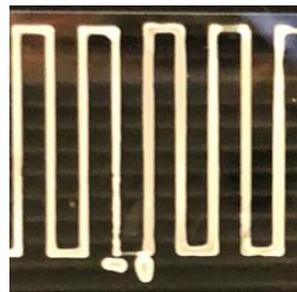
In school, I had studied German at A-Level, and wanted to use this skill further, and I have always been interested in working in Germany at some point.

I was slightly apprehensive about working with a group of researchers far more qualified than myself, but the research group, which consisted of around 20 people, proved to be a very welcoming and diverse group of people. People from all over the world, including India, Spain, Austria, Nigeria, Russia and of course Germany welcomed me in a friendly working environment. The group would usually have lunch together in the common room, and strict opening hours for the lab, meant that a good work-life balance was maintained.

The group was working on producing inverse photonic structures which would be used to form structural colors as well as thermal barrier coatings. My work was to devise a method to form layers of these structures with optimal parameters. This was to be done by using a custom-made direct writing equipment to form colloidal structures of micro-scale PS (polystyrene) particles, which were infiltrated in a TEOS (Tetraethyl orthosilicate) solution, in a single step. Previously this had been carried out in two separate steps. The TEOS is in a solution with Hydrochloric acid and ethanol and undergoes a “sol-gel” reaction to form silica. The PS particles are then burnt off in a furnace to leave the desired inverse silica structure.



*Left: A SEM image of a printed line of the inverse silica structure, following burnout.*



*Right: A series of lines printed using the custom-made equipment, before burnout.*

Most of my work was carried out independently with direction from my direct supervisor. The main challenges came with the hot, dry conditions in the lab at the end of August following a heatwave. This meant that the printer, which used a fine needle tip, kept drying out and getting clogged up, meaning that no further experimental work could be carried out in the afternoon.

Outside of work I was very fortunate as the 9 Euro ticket campaign was on in Germany. This enabled me to take all public transport for a cost of 9 euros for the entire month.

As such I was able to visit Düsseldorf, Cologne, Bremen and Schwerin as well as explore Hamburg.

I visited the main attractions in Hamburg, including the Elbphilharmonie concert hall, and the impressive town hall. I was also able to visit Cologne cathedral, Schwerin castle, and the much smaller, and

older city of Bremen. The longer trip to Cologne and Düsseldorf, meant that I requested to have a single Friday off, for a three-day weekend in the area.

The main trouble I had, was with finding other students of a similar age to spend time with. I was happy to spend time with the other research students and the PhD students in my accommodation, but the vast majority of students were post-graduates and at different points in their lives to myself.

The main skill that I developed during this process, was with how to build up a research process in a systematic manner, as opposed to trying out random solutions in a manner which is difficult to then justify and explain to your peers. I found that clear plans and methods had to be constructed in order to strategically find the optimal method to form the desired structures. This also then made the analysis of my data far easier.

This experience has encouraged me to consider a career in research more seriously. I am now more fixed on the idea of at least completing a masters in Cambridge, and I am planning on spending the summer of 2023, also conducting a research placement in a university if possible. I am grateful to my hosts at TUHH, particularly my supervisor Alex Plunkett, and to the Armourers & Brasiers' Company for giving me this opportunity.

