

JCCU Industrial Tour 2023 to Leipzig, Germany Tour Report

by student leaders Tobie Dedrick (St. Catherine's College) and Qianyi Sun (St. Edmund Hall)

In 2023 24 undergraduate students and accompanying tutor Dr Barbara Gabrys visited Leipzig, Germany for 6 days. The attendees of the trip and the student leaders would like to extend our thanks to The Worshipful Company of Armourers and Brasiers; The Worshipful Company of Ironmongers; and the Department of Materials at the University of Oxford for their generous sponsorship of the trip.

We would also like to thank those from the Department of Materials for their invaluable help in organising the tour: Dr Adrian Taylor; Tara Haydon; Dr Barbara Gabrys; all in the Materials Finance Office.

The groups made visits to the following companies and institutions:

1. Fraunhofer Institute for Ceramic Technology and Systems (IKTS) in Hermsdorf, Germany
2. The Institute for Chemical Technology at Leipzig University
3. TESVolt in Wittenberg, Germany
4. Porsche in Leipzig, Germany



Saturday 18th March, outbound journey:

We flew from Heathrow (LHR) to Berlin Brandenburg Airport (BER) at 15:55 with minimal delays. From the airport train station, the group boarded a regional train to Berlin Central rail station. Unfortunately, the intercity express from Berlin to Leipzig was delayed by 1hr due to 'animals on the tracks'. This didn't end up being a problem and we checked into the hostel within our allotted window at 12:00am.

Sunday 19th March, free day:

A rest day on Sunday allowed everyone to get settled at the hostel and explore Leipzig at their own pace. Many went to visit Leipzig Zoo, while others tried to visit the Red Bull Stadium, only to find it closed. The evening was closed out by trips to local pubs and restaurants.

Monday 20th March, Fraunhofer IKTS:



Above: the group outside the entrance to Fraunhofer IKTS after the tours.

Our first visit was to the ceramic research institute Fraunhofer IKTS in Hermsdorf. Founded as the Hermsdorf Institute for Technical Ceramics (HITK) in 1992, it was initially separate from the Fraunhofer group, but was assimilated in 2010. Annegret Kolarow, our contact, introduced us to Prof. Dr. Ingolf Voigt who gave us a summary of the history of the institute. Arno Görne then gave a presentation about his group and their work on functional ceramics for use in sensors and microelectronics applications; Dr. -Ing. Matthias Schultz discussed his group's work on sodium-based battery technology. The group found the tour of the labs where sodium-ion battery technologies are developed to be eye-opening, as it provided a new perspective on the concepts learned in the electronic structure and electrochemistry modules we do as part of our undergraduate degrees.

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Tuesday 21st March, the Institute of Chemical Technology at Leipzig University:

Our visit to the Institute of Chemical Technology at Leipzig University was largely focused on heterogeneous catalysis. Dr Michael Goepel presented the institute's current research areas in catalysts for Direct Air Capture – capture of CO₂ from the atmosphere for reaction to make value added products - and other technologies planned to aid in the transition away from fossil fuel dependence within the chemical synthesis industry. Following this we were shown some of the institute's facilities, including a TEM for general imaging and diffraction experiments, and X-ray photoelectron spectroscopy (XPS) for elemental characterisation. A few researchers



were present during part of the tour and discussed their work developing methods for extracting chemical building blocks for chemical synthesis, such as methanol, from biomass. The tour provided a great opportunity to experience a materials/physical chemistry department different to our own, and to see the sort of research that they carry out.

Wednesday 22nd March, TESVOLT:



After a slightly delayed coach we arrived at TESVOLT's Gigafactory in Lutherstadt Wittenberg, greeted by an expansive complex and many electric vehicle charging points. After some brief introductions, Ingo Valldorf, responsible for Corporate and Financial Communications, also our contact, began by introducing the company, including the 'agile' working system, and its sustainable and innovative vision. Following this, Dr. Dajian Li, the Battery Cell Specialist at TESVOLT, provided an in-depth exploration into the prismatic Samsung SDI cells that the company uses for their energy storage solutions, the lithium-ion cathode phase present in the cell, and why these cells are optimal for their

products. The advantages and disadvantages of the different form factors and lithium-ion compositions of the cells were weighed, with this analysis being particularly helpful for the electrochemistry and materials selection part of the degree. A particularly wonderful tour of the gigafactory followed, with both Ingo and Dajian presenting further technological innovations such as a unique one-way, high-voltage cable to easily and efficiently connect cell blocks. There were also functional innovations, such as a market-leading testing facility, including a very well-named testing device named "Karl the Great", which allows the performance and lifetime of each component to be tested. Overall, a wonderful visit to an industry-leading company, providing us the opportunity to learn more about cell technology and battery production.

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Thursday 23rd March, Porsche Leipzig:

Journeying to the north of the city to Porsche Leipzig's factory, experience centre, and test track, we were greeted by company representatives. After a short film about the history of the company in the city, we were divided into groups, and we were shown the intricacies of the assembly line for the Panamera and Macan. Notably, the integration between robots and employees, with many more robots used in pre-assembly (for engine casting, body work and so on), and fewer for menial jobs like installing windscreens, carrying tools, engine blocks, and whole cars. We were



shown the precisely cast and finished Al-Si engine blocks, alongside the alloy and ceramic composite brakes, which each had their pros and cons dependent on conditions, weight optimisation, and price. The aluminium alloy frames, instead of steel, of the vehicles and the alkali-aluminosilicate glass, instead of other tempered glass, were both used due to their high strength, low weight, and can both be recycled. All of these components were 'married' together in the assembly line, which, alongside being an absolutely beautiful sight to behold, also provided a good look into the automotive industry and how crucial composites are, alongside how modern developed materials are crafted into products.

Evening: End of Tour Dinner – Ratskeller Leipzig



After much searching and many fully booked restaurants, we were recommended Ratskeller Leipzig for their traditional style and large capacity, conveniently located within walking distance from the hostel. Much Bier was drunk, largely from 1Ltr Steins, and everyone enjoyed some typical German cuisine – the perfect way to round off a successful Industrial Tour.