



**Abstract:**

This report presents an overview of the NANOSIMS Facility at *Utrecht University, Department of Earth Sciences*, focusing on Mass Spectrometry. The institute graciously hosted our training in Nano Secondary Ion Mass Spectrometry (NANOSIMS) and elemental analysis from *1st June to the end of June*.

**Introduction:**

The NANOSIMS Facility at Utrecht University is an advanced research center dedicated to investigating nanoscale geochemical processes. Equipped with cutting-edge mass spectrometers and sophisticated analytical tools, the facility enables researchers to explore the elemental and isotopic composition of various materials with high precision and resolution. This report highlights the institute's exceptional hospitality and outlines our research project, which involved training in Nano SIMS and studying the elemental composition of atmospheric elements in materials.

**Methodology:**

1. Nano SIMS Training: The research team at the NANOSIMS Facility provided comprehensive training on operating the Nano SIMS instrument, familiarizing us with its functions, data acquisition procedures, and data interpretation techniques. This training was crucial for ensuring accurate measurements and reliable data throughout our research.
2. Sample Preparation: Carefully collected samples were fixed, sectioned, and mounted on suitable substrates to facilitate imaging and elemental analysis.
3. Nano SIMS Analysis: Prepared samples underwent Nano SIMS analysis, with the instrument's primary ion beam rastered over the sample surface, generating secondary ions that were detected and quantified to reveal the elemental composition with nanoscale resolution.

4. Data Analysis: The obtained data from the Nano SIMS analysis were processed and analyzed using specialized software. Elemental maps and spectra were generated to study the spatial distribution of elements, particularly carbon and carbon dioxide, within the bacterial cells.

### **Conclusion:**

In conclusion, the NANOSIMS Facility at Utrecht University, Department of Earth Sciences, serves as a pioneering research hub for studying nanoscale geochemical processes. Our research, focusing on Nano SIMS analysis of samples for elemental composition, has contributed valuable insights to the fields of Geochemistry, microbial ecology, and semiconductors.

During the traineeship, I gained detailed knowledge about the working of the NanoSIMS instrument. Towards the end of the fourth week, the tuning and testing phase was completed, allowing me to experience measurements of samples. Additionally, I learned and applied software tools for the analysis of NanoSIMS data.

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