



LVEM 5 User Story : Charles University, Faculty of Science Department of Inorganic Chemistry

The Department of Inorganic Chemistry at the Faculty of Science, Charles University, focuses on classical inorganic chemistry with a strong emphasis on structural chemistry and the chemistry of elements. The department comprises several research groups, including organometallic chemistry, coordination chemistry, and solid-state chemistry and nanomaterials. Within the latter, three major groups operate: one dedicated to magnetic nanomaterials, one focusing on materials for energy-related applications, and another specializing in optical and nonlinear optical materials. The LVEM 5 is installed within the solid-state chemistry and nanomaterials group, where it supports both research and teaching activities.

Can you briefly introduce your research group and its focus?

doc. RNDr. Václav Tyrpekl, Ph.D.:

We work within the solid-state chemistry and nanomaterials group at the Department of Inorganic Chemistry, Faculty of Science, Charles University. Our research is primarily oriented toward materials for energy applications. Alongside us, there are two groups: one focusing on magnetic nanomaterials and

another on optical materials, particularly nonlinear optics. The LVEM 5 is located directly in our laboratory and serves several of these activities.

Do you collaborate with other institutions?

doc. RNDr. Václav Tyrpekl, Ph.D.:

Within the Czech Republic, our group collaborates extensively with institutes in Řež, including the Institute of Organic Chemistry and

Biochemistry of the Czech Academy of Sciences, the Nuclear Research Institute, and the Research Centre Řež. Internationally, we collaborate with colleagues from the University of Cagliari in Italy, who prepared the very first sample we tested under the microscope, as well as with colleagues from the University of Vilnius in Lithuania.

Why did you choose the LVEM 5?

doc. RNDr. Václav Tyrpekl, Ph.D.:

We were looking for a small, compact electron microscope that would fit into our limited laboratory space. The LVEM 5 was selected primarily for its compact size and the ability to configure it to our specific needs. We required an instrument that is simple, fast to operate, and suitable for routine measurements. For highly specialized samples requiring ultimate atomic resolution, we can access larger, highly corrected microscopes elsewhere. However, for everyday work and sample pre-characterization, having an instrument like the LVEM 5 directly in our lab is a major advantage.

Mgr. Michaela Fridrichová, Ph.D.:

Although I joined the group after the purchase decision had been made, I initially considered instruments with a larger sample chamber. Nevertheless, I am very enthusiastic about the LVEM 5. It has proven extremely useful and adds significant value to our daily research activities.

What do you primarily use the LVEM 5 for?

doc. RNDr. Václav Tyrpekl, Ph.D.:

For our group, the TEM mode is particularly important. We use it to study oxide nanoparticles with specific shape anisotropy, where image contrast is crucial for clearly resolving particle shape and morphology. These morphological features are key parameters that influence the materials' physical properties. Another important application is the investigation of delaminated and layered materials, where we examine stacks of several layers, not at the atomic level, but on the scale of few-layer systems.

Mgr. Michaela Fridrichová, Ph.D.:

From the perspective of the materials chemistry group, the SEM mode is especially valuable for an initial overview of samples such as nanotextiles or molecular materials, particularly with respect to grain size and surface morphology, provided that sufficiently small samples can be prepared. We also see strong potential for pedagogical use. In the medium to long term, we plan to incorporate the LVEM 5 into advanced practical courses, enabling students to become

familiar with electron microscopy in a clear, intuitive way. The instrument is highly didactic, as the processes are immediately visible and the microscope does not feel like an inaccessible black box.

Mgr. František Krakl:

Overall, one of the greatest benefits of the LVEM 5 for us is the ability to efficiently screen a large number of samples. This allows us to select the most promising candidates for more detailed characterization.

How difficult was it to prepare the space for installation?

doc. RNDr. Václav Tyrpekl, Ph.D.:

The site preparation was very simple and required almost no special modifications.

How was the instrument funded?

doc. RNDr. Václav Tyrpekl, Ph.D.:

The LVEM 5 was funded through a project to equip new laboratories, complemented by internal institutional resources.