

Single crystals and beyond - research and study in Kharkiv amid explosions and air alarms

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Kharkiv has long held a prominent place in Ukraine’s intellectual and scientific landscape. As one of the country’s most significant educational and academic centres, it has nurtured generations of scientists, engineers, and scholars, and is home to world-class research institutions, including the State Scientific Institution “Institute for Single Crystals” of NAS of Ukraine.

Our Institution has a rich legacy in crystal growth and materials science. With over 70 years of achievements, researchers here pioneered the crystal growth and application of a wide array of scintillation and laser materials, from early plastic scintillators and CsI(Na) crystals in the 1960s to modern YAG:Nd laser elements, flexible scintillation panels, and CdZnTe detectors. The development of materials like sapphire surgical tools and large (up to 500 kg) single crystals of CsI and NaI showcases deep-rooted expertise of us in both fundamental and applied crystallography.

Notably, Kharkiv’s scientific community played active roles in numerous international collaborations. Yet the annexation of Crimea in 2014 and subsequent Russian military aggression inflicted significant losses: disruption of established partnerships, loss of access to vital infrastructure, and displacement of leading scientists and manufacturing capacity.

Undeterred, our scientists pursued new directions as crystallography for pharmaceuticals conducting research at the intersection of crystal chemistry and drug development. Through advanced X-ray diffraction studies and quantum chemical modelling, our teams lead by Dr. Svitlana Shishkina investigated polymorphism, weak intermolecular interactions, and supramolecular architectures crucial for drug efficacy and stability. These advancements positioned Kharkiv as a key player in molecular crystal research and medicinal material design.

The Russian invasion on February 24, 2022, marked a devastating turn. Universities and academic institutions were shelled; researchers and students were forced to flee. Many institutions were damaged or destroyed, and education was halted. Yet, in the face of destruction, the scientific community responded with courage and ingenuity. Those who remained took immediate action to preserve equipment, secure critical samples, and relocate sensitive operations. In our Institution the crystal growth facilities, for example, were re-established in safer locations, and power outages were managed to maintain laboratory functions.

Incredibly, by 2023, a new laboratory for drug development and molecular-genetic diagnostics was opened, later expanding in 2024. Despite infrastructure and financial constraints, research continued in key areas: analytical chemistry, crystal engineering, sorption materials for radiochemical analysis, and novel detector development for nuclear safety. Projects that began under peaceful conditions – with international partners from Germany, France, Lithuania, USA and beyond – survived and evolved amid war.

Initiatives like the Kharkiv Chemical Seminar, launched in April 2022, connected local researchers with global leaders – including five Nobel laureates – bringing knowledge and moral support to war-affected scholars. The seminar became a platform of hope and continuity, with 38 distinguished lecturers participating from Europe, North America, and Israel.

Still, challenges persist. Both education and research are deeply affected by migration, damaged infrastructure, and daily missile threats. Alarms sound up to 125 times a month in 2025, making in-person classes nearly impossible. Scholars are under constant strain, with limited access to resources and literature.

We call upon the international academic community to support Ukrainian researchers through open access to journals, databases, and software tools. The endurance of Kharkiv’s scientific community proves that even amid bombardment and loss, knowledge and discovery can thrive—with solidarity and shared purpose.

Despite the turmoil brought on by war, Kharkiv continues to stand as a symbol of academic resilience.