



Stewart Blusson Quantum Matter Institute
University of British Columbia
March 30th, 2025
mohamed.oudah@ubc.ca

Dr. Julie-St-Pierre, Interim Vice-President, Research and Innovation
University of Ottawa (UOttawa)
550 Cumberland St., room 246
Ottawa, ON K1N 6N5 Canada

Dear Chair and Members of the Search Committee,

My name is Mohamed Oudah. I am writing to apply for the Tier 2 Canada Research Chair, tenure-track position for a leader in experimental quantum materials physics. I am a Research Associate (Senior Scientist) at the Quantum Matter Institute at the University of British Columbia (UBC) working on the synthesis, transport measurements, x-ray and neutron diffraction, and muon-spin relaxation study of quantum materials. I have worked in several labs internationally and published a wide range of studies on quantum materials physics as part of these labs. I maintain ongoing strong collaborations with leading scientists covering a very wide range of expertise in theory and experiments on quantum materials. At the UOttawa, I will conduct research focused on superconducting and thermoelectric 2D materials, where I will build up new inorganic synthesis and low temperature measurement capabilities and leverage the existing characterization and MOCVD facilities.

I have experience working in different departments including chemical engineering, chemistry, and physics. I joined UBC and the Max Planck-UBC-UTokyo Centre for Quantum Materials as a postdoctoral fellow. Recently I worked on the transport and magnetic properties of 2D and quasi-2D materials CaSb_2 , LaSbTe , EuSb_2 , PdCoO_2 , and NbIrTe_4 . Working with Prof. Doug Bonn at UBC, I have synthesized single crystals of high temperature superconductors (2D) for collaborative experiments, including cuprates and $\text{Fe}(\text{Se}, \text{Te})$. In addition, I have contributed to neutron and muon experiments on the quasi-1D materials Ti_4MnBi_2 and V_2Ga_5 . I worked at the Max Planck Institute in Stuttgart with Prof. Bernhard Keimer and Prof. Hidenori Takagi on Ag compounds synthesized under high-pressure. This includes identifying a new phase of AgSbO_3 , bond-disproportionated bismuthate Ag_2BiO_3 , and charge-entropy-stabilized rocksalt structure of superconducting $(\text{Ag}, \text{Sn})\text{Se}$.

I visited Prof. Leslie Schoop's lab in Princeton University on an exchange working on 2D square-net materials. This visit contributed to collaborative papers between UBC and Princeton University on ZrSiTe and ZrSiSe . I am now working on a closely related family of topological antimonides at UBC with Prof. Meigan Aronson and Prof. Doug Bonn, our recent work on the non-symmorphic semimetal CaSb_2 demonstrates unconventional superconductivity in this class of materials for the first time. Recently, I discovered superconductivity and electron-phonon drag in non-centrosymmetric semimetal LaRhGe_3 , where I initiated collaborative experiments with multiple groups. My work on LaRhGe_3 demonstrates the first report of electron-phonon drag in the class of MTX_3 compounds crystalizing in the $I4mm$ space group. Furthermore, I have been working with Prof. Alannah Hallas on high-entropy oxides, where we utilize high levels of site-disorder as a knob for tuning the stability and properties of materials.

I hold a chemical engineering undergraduate degree from UOttawa, and spent one year at NTT Basic Research Lab in Japan as part of my degree. During that year, I worked on characterization of heterostructures of III-V semiconducting thin-films with an intermediate BN layer. I worked with Prof. Elena Baranova for my undergraduate thesis on PtIr nanoparticles for ammonia electro-oxidation, and during my postdoc I used electro-oxidation to grow crystals of $(\text{Ba}, \text{K})\text{BiO}_3$. During my master's degree in solid-state chemistry and nanotechnology, I worked with Prof. Holger Kleinke at the University of Waterloo on thermoelectric materials. I achieved the highest thermoelectric efficiency, related to dimensionless figure-of-merit zT , in barium copper chalcogenides, where I achieved a $zT > 0.8$ in $\text{BaCu}_6\text{SeTe}_6$ thanks to localized (0D) liquid-like copper ion mobility.



a place of mind

THE UNIVERSITY OF BRITISH COLUMBIA

With a strong interest in the physics of materials, I decided to pursue my PhD at a physics group to bridge the chemistry and physics perspectives in my research. For my PhD at Kyoto University, I worked on the antiperovskite oxides with Prof. Yoshiteru Maeno where I discovered superconductivity in the Dirac semimetal $\text{Sr}_{3-x}\text{SnO}$, the first antiperovskite oxide superconductor. I developed techniques for handling air-sensitive samples during the synthesis and low temperature measurements of the highly air-sensitive antiperovskite oxides. During my time in Japan, I had the chance to interact with people from different backgrounds and cultures, from theoretical physicists to chemists, and supervised the experimental work of master's and exchange students. I also presented our findings at the conference held by Japan Physical Society and to the local press at Kyoto University, both in Japanese.

During my postdoctoral fellowship, I was fortunate to work with a number of leading chemists and physicists. This helped me further shape my own interests in materials research by interacting with research at the cutting-edge of their respective fields. At UOttawa, I will work on crystal growth, low temperature transport, and spectroscopy measurements of new quantum materials, as well as muon spin relaxation experiments. My proposed research will expand on the current activity at UOttawa to include searching for new topological thermoelectric and superconducting materials, and stabilizing new crystalline phases by utilizing high-entropy and high-pressure synthesis. My research will contribute to the research on energy materials and materials for quantum information.

Beyond conducting research, I am committed to teaching students and nurturing their motivation for learning inside and outside of the classroom. I have a robust experience teaching undergraduate tutorials at the University of Waterloo as well as student supervision throughout my academic career. I mentored and supported graduate students by promoting their participation in international conferences, honing their presentation skills and publishing their studies in academic journals. At UOttawa, I hope to develop and improve my own teaching style by collaborating with experienced faculty and develop new courses that combine physics and chemistry concepts in relation to material science. My lab will provide samples that will help foster collaborative work among faculty and students interested in exploring the physics of quantum materials.

I am a Canadian citizen, a native English and Arabic speaker. I have come to master Japanese after spending only a few years in Japan. My French is at a beginner level. Having learned multiple languages, one of which during my PhD, gives me the confidence that I will achieve proficiency in French before tenure at UOttawa. Learning French will help me develop an inclusive Canadian teaching approach, and further develop collaborations that I have started with groups at McGill University, École Polytechnique and ESPCI Paris. I include the contact information for three references in my CV.

I remain available for further information. Thank you for your consideration.

Sincerely,

A handwritten signature in black ink, appearing to read 'M. Oudah', with a horizontal line extending to the right.

Mohamed Oudah