



Stewart Blusson Quantum Matter Institute
University of British Columbia
January 6th, 2025
mohamed.oudah@ubc.ca

Materials Department,
College of Engineering,
University of California, Santa Barbara

Dear Chair and Members of the Search Committee,

My name is Mohamed Oudah. I am writing to apply for the Assistant Professor position at the Materials Department at the University of California, Santa Barbara (UCSB). 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 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.

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, and I worked at the Max Planck Institute in Stuttgart working 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 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 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 the University of Ottawa, 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 in barium copper chalcogenides, where I achieved a high figure-of-merit $zT > 0.8$ in $\text{BaCu}_6\text{SeTe}_6$ thanks to liquid-like copper ion mobility.

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.



a place of mind

THE UNIVERSITY OF BRITISH COLUMBIA

During my postdoctoral fellowship, I was fortunate to work with a number of established 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 UCSB, 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 UCSB 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 UCSB, 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 new chemistry and physics of materials.

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 stylized flourish extending to the right.

Mohamed Oudah