Stewart Blusson Quantum Matter Institute
University of British Columbia
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Department of Applied Physics and Materials Science,
Division of Engineering and Applied Science,
California Institute of Technology,
Pasadena, California, United States

Dear Chair and Members of the Search Committee,

My name is Mohamed Oudah. I am writing to apply for the tenure-track Assistant Professor position at the Department of Applied Physics and Materials Science at California Institute of Technology. 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 (Ag,Sn)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 $LaRhGe_3$, working 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 *I*4*mm* 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 $(Ba,K)BiO_3$. 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 $BaCu_6SeTe_6$ thanks to liquid-like copper ion mobility.

With a strong interest in condensed-matter, 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 $Sr_{3-x}SnO$, 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

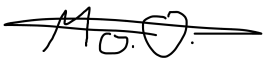
chemists, and supervised master's and exchange students. I also presented our findings at the conference held by Japan Physical Society and to the press at Kyoto University, both in Japanese.

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 condensed-matter by interacting with research at the cutting-edge of their respective fields. At California Institute of Technology, 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 Caltech to include searching for new topological thermoelectric and superconducting materials, and stabilizing new crystalline phases by utilizing high-entropy and high-pressure synthesis.

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 California Institute of Technology, 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 physics.

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

Sincerely,



Mohamed Oudah