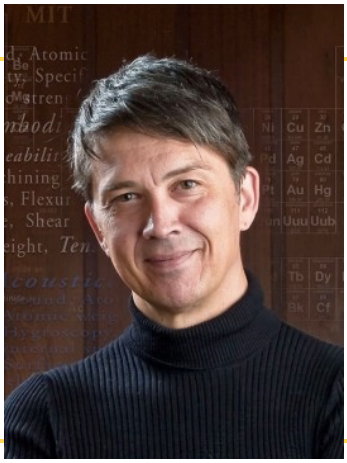
Leaders in Energy Sustainability

DALHOUSIE UNIVERSITY

BIOGRAPHICAL SKETCH



GERBRAND CEDER-PH.D.

UC Berkeley | California, United States

Written By Sarah Clarke, M.Sc. Trainee in Chemistry
Mar 2022

Dr. Ceder is a leader in the field of high-throughput computing, whose work has led to significant advances in materials discovery for batteries. Dr. Ceder is the principal investigator for the Computational and Experimental Design of Emerging materials Research group (CEDER) at UC Berkeley. His group's combined focus on computing fuelling experiment has led to significant advances in Li-ion battery cathode materials discovery, notably with the design of a lithium nickel manganese oxide with a charge and discharge rate capability considerably higher than lithium cobalt oxide, a commonly used cathode material. A few of his favourite aspects of his career right now include the busy scientific atmosphere of his research group, being able to interact with dynamic, intelligent young people and his role as an educator. Writing, travel, and the sense that something is always "happening" are more of what he enjoys with his career. One drawback, however, is the general atmosphere of academia, where things tend to move slowly, and progress is hindered by fundraising and bureaucracy. This is a relatively common criticism of academia, where inefficiencies in university administration cause repercussions that are mostly felt by faculty, staff, and students.

Through his experience both in academia and industry, Dr. Ceder has learned important lessons on how to optimize your time involved with each. One of the greatest challenges when working with industry partners is coming to an agreement for what the company wants, compared to what you as the scientist can feasibly provide. Bridging the gap between fundamental science and applied problems is a challenge that isn't unique to materials science. One lesson Dr. Ceder learned is that the effort involved in the translation of knowledge will vary greatly between business partners. Scientists need to be willing to "learn the language" of their industry partners, and the companies must do the same. Often, companies will ask for a solution to whichever technical problem they're currently faced with. The effectiveness of high-throughput computing, however, lies with the ability to quickly explore directions for long-term development. In industries reliant on exploring new functional materials such as battery manufacturing, the long-term approach is much more beneficial.

One of the most important things Dr. Ceder has learned was how to optimize his workday and is something he recommends to students. He teaches a thermodynamics course in the fall semesters and has taken care to develop a work schedule that suits his preferences. In the mornings, he tries to dedicate his time for work that requires more quiet concentration such as reading and writing for papers, proposals, and grant applications. This gives him the opportunity to do more interactive work in the

afternoons, such as meeting with students and faculty. One of the biggest pieces of advice he has for students is to really think critically about your habits and figure out how you work best. Learning when you're able to be most productive and best suited for different tasks, and subsequently arranging your schedule to accommodate yourself, will be invaluable throughout your career. Another lesson learned in his career is the value of a good phone call! Even the smallest problems could take an extensive e-mail exchange to resolve, when a 2-minute conversation could suffice. Frequently, he circulates around to visit his students to catch up, give advice, and problem-solve. Through his many different roles, Dr. Ceder has established himself as an authority in computational materials discovery and has contributed to great advances in improving sustainable battery materials.

Beginning his academic career studying engineering at University of Leuven, Belgium, Dr. Ceder received his Ph.D in materials science from University of California at Berkeley. After 24 years as a professor at Massachusetts Institute of Technology (MIT), he returned to UC Berkeley, where he splits his time between the University and the Lawrence Berkeley National lab. His research group at UC Berkeley combines computational and experimental methods to expedite discovery, synthesis, and characterization of lithium, sodium, and multivalent battery materials. With these research themes, he has collaborated with the Joint Center for Energy Storage Research to apply first-principles calculations in the development of novel high energy density batteries. Throughout his time as a professor, he has worked with numerous industry partners involved in computational materials science. While screening new alkaline cathode materials with a major battery manufacturer, the groundwork was laid for high-throughput computational materials design. This led to the development of the Materials Project, now led by Dr. Kristin Persson. The Materials Project is an open-access database of computed properties for over 100,000 inorganic compounds and 60,000 molecules. This database is now used by over 120,000 researchers worldwide.