

UCSD NANOENGINEERING/CHEMISTRY & BIOCHEM
SPECIAL SEMINAR

March 2nd 2022

Seminar Presentation: 11AM-12

SME room 248

“Materials for a Sustainable Future: Carbon Capture and Water Harvesting from Desert Air”**Omar M. Yaghi***James and Neeltje Tretter Chair**Professor of Chemistry**Department of Chemistry**University of California, Berkeley*

Abstract: The clean air, clean energy, and clean water challenges facing our planet today impact our health, wealth, happiness, and future. These three stresses present difficult science and engineering problems to solve as they require, among many aspects, the selective capture of small molecules (e.g. hydrogen, methane, carbon dioxide, and water). Our ability to capture, store, manipulate, and harness the power of these molecules in an efficient and economical manner is paramount to our success in building a sustainable future. The emerging field of reticular chemistry and materials has yielded extensive classes of nanoporous metal-organic frameworks and covalent organic frameworks. The flexibility with which these materials can be made, modified, and scaled bodes well for their integration into devices and providing robust solutions to these challenges. In this presentation, I will highlight how thirty years of establishing the basic science of reticular materials has led us to carbon capture from air and flue gas, and harvesting water from air to produce drinking water in various parts of the world regardless of temperature and humidity levels. Our efforts in taking this technology from the laboratory to the field including the design and engineering of prototypes will be discussed and the results presented. The establishment of MOFs and COFs as a global research activity has led to infinite number of materials which when coupled with engineering of devices offer new, unparalleled opportunities for solving the three stresses facing our planet.

Educational Development and training: This presentation shares how basic science and engineering can be seamlessly blended to solve some of the most vexing problems facing society; namely, clean air, clean energy, and clean water. It will illustrate how the mentoring relationship, we take for granted, between professors and undergraduates/graduates/postdocs is the key to discovery, sustainable innovations and to solving difficult problems. Fundamentally, the great number of possible materials and the plethora of emerging applications inevitably will require robotics and AI tools to realize the notion of ‘materials on demand’. The widespread research on reticular materials has motivated the speaker’s efforts in building research institutes in many developing countries in order to capture the potential of emerging scholars and realize their dreams by plugging into research at an early age.

Biosketch: Professor Yaghi has published over 300 scientific articles and has received over 190,000 citations for which he is listed among the top-most cited chemists. He is a member of the US National Academy of Sciences and has been honored with many awards for his scientific accomplishments from 15 countries. These include: Materials Research Society Medal (2007), American Chemical Society Materials Chemistry Award (2009), The Royal Chemistry Society Centenary Prize (2010), King Faisal International Prize in Science (2015), Mustafa Prize in Nanoscience and Nanotechnology (2015), TÜBA Academy Prize in Basic and Engineering Sciences (2016), the Medal of Excellence of the First Order bestowed by the King of Jordan His Majesty King Abdullah II (2017), Albert Einstein World Award of Science (2017), BBVA Foundation Frontiers of Knowledge Award in Basic Sciences (2017), Kuwait Prize in Basic Sciences (2017), Wolf Prize in Chemistry (2018), Prince Sultan bin Abdulaziz International Prize for Water (2018), ENI Award for Excellence in Energy (2018), the Mohammed bin Rashid Medal of Science of United Arab Emirates (2019), Gregori Aminoff Prize by the Royal Swedish Academy of Sciences awarded by the King of Sweden His Majesty Carl XVI Gustaf (2019), August-Wilhelm-von-Hofmann-Denkünze of the German Chemical Society (2020), Royal Society of Chemistry Sustainable Water Award, United Kingdom (2020), and VinFuture Prize for Emerging Science and Technology Innovations (2021).