Name: Zakaria Jibrin

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Home institution: University of Maryland Baltimore County (UMBC)

Name of task: Creating a new method for structural identification of poorly crystalline and amorphous materials in preparation for Mars sample return and to better interpret data collected onboard the Curiosity rover.

Role in task / what they do for CRESST: My research involves synthesizing analogue materials in the laboratory, characterizing them with conventional methods such as benchtop X-ray diffraction, and then resolving their short-range order with the NSLS-II synchrotron at Brookhaven National Laboratory. With this data, my team and I are creating a model that can be used to search match against our library and identify/quantify the amorphous components in any complex geological mixtures. This research will not only be incredibly helpful for NASA's Mars, Lunar, and return missions, but also to a wide range of scientists studying terrestrial materials which contain an amorphous component.

Background / Autobiography? During my undergraduate studies in Geology at the University of Arizona, I was privileged to work at RRUFF, a cutting-edge mineralogy laboratory dedicated to compiling an extensive database of Raman spectra, X-ray diffraction, and chemical data for every known mineral in nature. It was within this dynamic environment that my colleagues and I made significant contributions by discovering several new minerals of intricate biological origin.

Motivated by these discoveries, I pursued a master's degree in Mineralogy at the University of Nevada, Las Vegas. During this time, my research, funded by NASA EPSCoR, delved into the formation of biominerals induced by halophilic bacteria that thrive in the extreme environment of Death Valley.

Subsequently, I joined NASA GSFC through CRESST, where my ongoing research has opened up fresh avenues of exploration. Specifically, my current focus described above has given me expertise in amorphous mineralogy leading to my current interest in elucidating the nature of amorphous biomineral precursors. This compelling line of inquiry has inspired me to embark on a Ph.D. program at Rutgers University commencing in the fall of 2024, where I aim to further expand our understanding of these intriguing biomineral precursors.

Favorite part of being a CRESST Scientist?

Working at NASA and having the opportunity to contribute to active and future Mars/Lunar missions is truly a dream come true for me. Pushing the boundaries of science is not just a career path but what I live for. The environment at NASA is like no other — a vibrant community where fresh ideas converge, providing an ideal melting pot for innovation and discovery. I am incredibly grateful to be part of this community, where I can actively engage in advancing our

understanding of nature.

List of publications, presentations, conferences they have spoken at etc.

Jibrin Z, Bristow T, Blake D, Sarrazin P, Walroth R, Downs R, Jibrin Z, Gailhanou M, Yen A, Zacny K (2019) CheMin-V: A Definitive Mineralogy Instrument for the Venera-D Mission. In: International Venus Conference

Jibrin Z, Jibrin Z, Sun H (2022) Spherulitic calcite in halophilic bacterial culture: New insights into roles of bacteria on mineral formation. In: Advanced Light Source (ALS) User Meeting

Jibrin Z, Jibrin Z, Sun H (2020) The formation of metastable mineral superstructures in halophilic bacterial cultures. In: GeoSymposium

Miyawaki R, Hatert F, Pasero M, Mills SJ (2020) IMA Commission on New Minerals, Nomenclature and Classification (CNMNC) – Newsletter 57. European Journal of Mineralogy 32:495–499. https://doi.org/10.5194/ejm-32-495-2020

Miyawaki R, Hatert F, Pasero M, Mills SJ (2019) New minerals and nomenclature modifications approved in 2019. Mineralogical Magazine 83:315–317. https://doi.org/10.1180/mgm.2019.23

Sun HJ, Zhang G, Jibrin Z (2023) Carbonate dissolution without acid: carbonate hydrolysis, catalyzed by photosynthetic microorganisms, in deteriorating stone monuments. https://doi.org/10.1101/2023.07.14.549033

Yang H, Gu X, Gibbs RB, Evans SH, Downs RT, Jibrin Z (2022) Lazaraskeite, Cu(C2H3O3)2, the first organic mineral containing glycolate, from the Santa Catalina Mountains, Tucson, Arizona, U.S.A. American Mineralogist 107:509–516. https://doi.org/10.2138/am-2021-7895

Three fun facts:

1: If telomeres didn’t shorten on every cell division we wouldn’t age.

2: You are a part of geology! The same minerals that form kidney stones during a UTI are formed the same way by microbes in Death Valley!

3: Babies between the ages of 6 to 9-months are SOOO good at perceptual facial recognition that they can learn and recognize distinct monkey faces!