Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.10414

Potassium [K+] at Life's Origins - Still a Mystery

HELEN GREENWOOD HANSMA

University of California at Santa Barbara

Presenting Author: hhansma@physics.ucsb.edu

Potassium [K+] at Life's Origins - Still a Mystery

Features that are shared by living cells of all types, such as the high intracellular [K^+] ~100mM, are likely to have evolved early in life's origins, but most research on the origins of life ignores potassium, K^+, or mentions it only superficially. The most evolved hypothesis for life's origins in high [K^+] is the hypothesis that biology emerged from biotite mica in micaceous clay [1].

In this scenario for life's origins, the necessary processes and components for life arose in niches between mica sheets, with **mechanical energy** from moving mica sheets as one of the energy sources. **Phase-separated biomolecular condensates** evolved to become ribosomes. Vesicle membranes encapsulated these processes and components. The resulting vesicles fused, forming protocells. Eventually all the necessary components and processes were encapsulated within individual cells, some of which survived to seed the early Earth with life.

1. Hansma, H.G. Potassium at the Origins of Life: Did Biology Emerge from Biotite in Micaceous Clay? *Life* **2022**, *12*, 301.

Potassium, K^+, is 100 mM between biotite mica sheets separated by 100 nm.

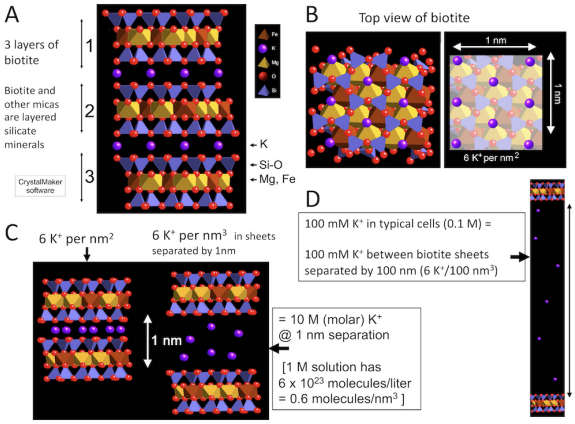

Figure 1. [K^+] between mica sheets. Structure of the black mica, biotite. (**A**) Side view of three biotite sheets, labeled '1', '2' and '3'. (**B**) Top view of 1 nm^2 biotite, with K^+ highlighted in the right-hand image, showing that there are six K^+ per nm^2 between mica sheets. (**C**) Side view of six mica sheets that are not separated and separated at a distance of 1 nm, where [K^+] = 10 M between the sheets. (**D**) Scale model of biotite sheets at a separation of 100 nm, where [K^+] = 100 mM. (CrystalMaker X software, version 10.6.4, CrystalMaker Software Ltd., Oxfordshire, UK).