Strong ^{13}C depletion of CO and organic synthesis in Early Mars atmosphere

Yuichiro Ueno[1,2], Johan. Schmidt[3], Matthew. S. Johnson[3], & Shohei Aoki[4]*

[1] Department of Department of Earth and Planetary Sciences, Institute of Science Tokyo, Japan

[2] Earth-Life Science Institute, Tokyo, Japan

[3] Department of Chemistry, University of Copenhagen, Copenhagen, Demark.

[4] University of Tokyo, Japan

*Presenting Author Email: ueno.y.ac@m.titech.ac.jp

Solar UV photolysis of CO_2 yields strong ^{13}C depletion of CO owing to wavelength-dependent isotope effect [1]. The inferred large carbon isotope fractionation mechanism was confirmed by our laboratory photochemical experiment [2] and is consistent with recent spectroscopic observation of Martian atmosphere [3-5]. In early Martian atmosphere, the remaining CO_2 may have enriched in ^{13}C owing to the isotope effect, even without the carbon escape into space, which is consistent with the observed C enrichment of carbonate in ALH 84001 [1,2]. Furthermore, the strongly ^{13}C-depleted CO should have been converted into aldehydes and carboxylic acids under a reducing early Mars atmosphere, and thus could have deposited into sediment [2,6]. The expected scenario could explain the observed strong ^{13}C depletion of some sedimentary organic matter in early Martian sediment [7].

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