

Missing organic materials from interstellar dust inside the Solar System

Hiroshi Kimura¹, Frank Postberg², Nicolas Altobelli³, and Mario Trieloff²

¹*Kobe University, Japan*, ²*University of Heidelberg, Germany*, ³*ESA-ESAC, Spain*

We tackle the conundrums of organic materials missing from interstellar dust when measured inside the Solar System, while undoubtedly existing in the Local Interstellar Cloud (LIC), which surrounds the Solar System. We solve the mysteries by demonstrating that organic compounds sublimate almost instantaneously by exothermic reactions, when solar insolation triggers recombination of free radicals or rearrangement of carbon bonds in the compounds. It turns out that the triggering temperature lies in the range of 20–50 K, by considering that sublimation of organic materials takes place beyond the so-called filtration region of interstellar neutral atoms. We find that in-situ measurements of LIC dust in the Solar System result in an overestimate for the gas-to-dust mass ratio of the LIC, unless sublimation of organic materials is taken into account. We also find that previous measurements of interstellar pickup ions have determined the total elemental abundances of gas and organic materials, instead of interstellar gas alone. We conclude that one must await a future exploration mission to the inner edge of the Oort cloud for a thorough understanding of organic substances in the LIC.