Laboratory Studies Towards Detectability of Astrobiologically Relevant Organics on Icy Surfaces

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Even if life exists elsewhere in our Solar System, its detection poses a serious problem – especially if it is deep below the surface of potentially habitable planets/moons/bodies. However, tracks of life (in terms of organics) or biologically relevant organics could be detected with ease, should these survive on the surface or near surface of the parent bodies. Among many icy solar system bodies, Europa has received special attention due to potential subsurface oceans (Van Hoolst, Rambaux et al. 2008; Wahr, Selvans et al. 2009). Europa also receives significant amount of radiation from Jupiter's magnetosphere(Paranicas, Mauk et al. 2007).

Electron penetration of icy surfaces plays an important role in radiation processing of solar system icy bodies. However, to date, there is no quantitative data available on the penetration depths of electrons through cryogenic water-ices, though modeling studies have been performed using approximate penetration data (Cooper, Johnson et al. 2001; Paranicas, Mauk et al. 2002). In our "Ice Spectroscopy Laboratory" at JPL, we have been conducting studies to understand the effect of radiation on organics embedded in solar system ice analogs. Electron and UV induced degradation of organics has been studies using simultaneous infrared and ultraviolet spectroscopy of these ices. Penetration through and the influence of electrons on ice films are also studied quantitatively. The results of these experiments will be analyzed and their relevance to the detectability of organics on solar system icy surfaces in the view of their astrobiological relevance will be presented.

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References

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