

From Interstellar Ices to PAHs

A symposium to honor Lou Allamandola's Contributions to the Molecular Universe
Annapolis, MD, USA - September 13th to September 17th, 2015

INVITED TALK

Observations of Ices in Protostellar and Protoplanetary Environments: Toward the JWST and ELT Era

Adwin Boogert¹

¹ Universities Space Research Association, Stratospheric Observatory for Infrared Astronomy, NASA Ames Research Center, Moffett Field, California 94035

E-mail: acaboogert@alumni.caltech.edu

Spectroscopic observations of icy grain mantles using the Infrared Space Observatory, the Spitzer Space Telescope, and ground-based telescopes so far are biased to dense clouds and the envelopes of protostars, where the features are strong, but the fluxes of high energy photons and particles needed for complex molecule formation are low (Boogert, Gerakines, & Whittet 2015). To constrain the ice composition and structure in more energetic conditions, sensitive, high spatial and spectral resolution observations of protoplanetary disk surfaces and tenuous envelopes are needed. Having gone through the protostellar collapse phase, these may then be directly linked to the icy building blocks of comets and planetesimals. I will show how observations with the James Webb Space Telescope and future ground-based "Extremely Large Telescopes" (ELT) may advance our knowledge of the ices in these regions. State of the art 2-3 μm adaptive optics spectroscopic and imaging observations of ice absorption and scattered light (Debes et al. 2008, Honda et al. 2009, Schegerer & Wolf 2010, Terada & Tokunaga 2012) show great promise, revealing signatures of icy grain growth and heating, and possibly of more complex ice species, in inner envelopes and protoplanetary disk surfaces.

REFERENCES

- Boogert, A.C.A., Gerakines, P.A., and Whittet, D.C.B. (2015) ARAA, 53 (in press)
Debes, J.Hh, Weinberger, A.J., Schneider, G. (2008) Ap. J. Lett. 673, 191
Honda, M., Inoue, A.K., Fukagawa M., et al. (2009) Ap. J. Lett. 690, 110
Schegerer, A.A., Wolf S. (2010) Astron. Astrophys. 517, 87
Terada, H., Tokunaga A.T. (2012) Ap. J. 753, 19