# Exploration of organic minerals on Saturn's moon Titan

**H.E. Maynard-Casely[1], R. Hodyss[2], T. Vu[2], M. Malaska[2], M. Choukroun[2], M. Cable[2] and T. Runčevski[3]**

*[1]Australian Centre for Neutron Scattering, ANSTO, NSW, Australia*
*[2]NASA Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA*
*[3] Department of Chemistry, Southern Methodist University, Dallas, TX, USA*

*helen.maynard-casely@ansto.gov.au*

Titan, the largest moon of Saturn, has been revealed by the *Cassini-Huygens* mission to be a fascinating and quite Earth-like world. Among the parallels to Earth, which includes the lakes, seas, fluvial and pluvial features on its surface, is an inventory of organic minerals [1]. However, where on Earth these organic minerals are only found in niche environments, on Titan they are likely to be the dominant surface-shaping materials. Titan's organic minerals are formed primarily from photochemistry induced by UV radiation and charged particles from Saturn's magnetosphere, which cause molecular nitrogen and methane (the primary components of the upper atmosphere) to generate into various CHN-containing species that deposit onto the surface [2].

Despite the ubiquity of these organic minerals upon the surface, it is difficult to understand their influence on the landscape and as, in some cases, even their crystal structure is unknown let alone wider physical properties[3]. Hence we have undertaken an experimental program to address this, and are currently focusing on the missing crystal structure and physical property understanding of a number of molecular solids and co-crystals that are likely to be organic minerals upon Titan. Using a combination of neutron diffraction, X-ray diffraction and Raman scattering we have studied molecular solids including ethane, acrylonitrile, acetonitrile, butadiene and propyne, and explored what co-crystal form from the inventory of Titan's molecules. This contribution will report highlights from these investigations.

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