

Complex cyanides and other organics in protoplanetary disks

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The Solar System emerged out of the Solar Nebula. The compositions of the Solar Nebula therefore set the bulk and organic composition of the young Solar System bodies, including the nascent Earth. In the present day Solar System, comets preserve a partial record of this chemistry. Observations of Solar Nebula analogs where planet formation is currently ongoing provides a different kind of information on this early Solar System chemistry. We have used the Atacama Large Millimeter Array (ALMA) to observe the organic chemistry in such protoplanetary disks with unprecedented sensitivity and spatial resolution. What we find is an active, rich organic chemistry that includes a number of different cyanides, formaldehyde and other organic molecules. The cyanide composition is remarkably similar to what is observed in comets, indicative of that at least some of these disks are chemical analogs to the young Solar System. We further use the spatial information from these observations to map out how the organic composition depends on the distance from the central star. The results are discussed in relation to Solar System studies of volatile organics, as well as our understanding of interstellar and protoplanetary disk chemistry.