# Melting of Tagish Lake Meteorite at High Pressure: implications for the fate of the Carbonaceous Matter

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Recent models of planets formation have faced the possibility that volatile-rich carbonaceous chondrites are the possible carrier of water and complex carbon molecules. The Tagish Lake (TL) meteorite is an ungrouped C2 chondrite whose bulk and organic chemistry compositions have received a considerable attention owing to the short-time exposure before sample collection. Recent studies on the spatial distribution and mineralogical association of organics in TL meteorite show affinity of organic compounds for S-bearing phases such as Fe-Ni sulfide coexisting with abundant carbonate, magnetite and serpentine phases. Therefore, the knowledge of the speciation of carbonaceous matter during the history of a meteorite at extreme pressures-temperatures is of fundamental importance to understand the volatile contribution during planet accretion and solve the mystery on the origin of life.

We carried out experiments at 5 GPa and temperature between 800-1600 °C using multi anvil apparatus. The recovered samples were polished for textural and chemical characterization of the mineral phases using FE-SEM, electron microprobe, respectively. Ultra-thin sections, ~100 nm thick, were prepared from the recovered samples using a focused ion beam, and then transferred to TEM grids for x-ray absorption near-edge spectroscopy (XANES) analyses of carbon using a scanning transmission X-ray microscope (STXM) at the Advanced Light Source, Lawrence Berkeley National Laboratory. Preliminary results show the stability of the aromatic component with development of graphene structure after high temperature and pressure experiment. Results are used to derive a model of accretion that takes into consideration the possible stability of polymerized carbon species along with elemental carbon and carbonate either liquid or solid. Possible implications for the evolution of the mantle redox state will be also discussed.