Characterization Of Early Solar System Aqueous Fluids

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Abstract: The most direct and convincing evidence for the presence of water and organic molecules on protoplanetary bodies is provided by fluid inclusions trapped in secondary minerals. Our research has demonstrated that early solar system fluids have survived as fluid inclusions in a few astromaterials that escaped significant shock, terrestrial alteration, and invasive sample handling. Our long-term goal is to measure bulk molecular and isotopic composition of individual fluid inclusions in meteorites and samples collected directly from asteroids to provide ground truth regarding the nature and evolution of aqueous fluids in the early solar system. Our current protocol is to locate candidate fluid inclusions using X-Ray Computed Tomography, and then make compositional measurements of individual fluid inclusions by coordinated Raman spectrometry, Transmission Electron Microscopy and, most recently, Time of Flight – Secondary Ion Mass Spectrometry.