Carbon Volatility and the Implications for Carbon Supply to Terrestrial Worlds

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The origin of highly volatile elements on terrestrial planets is a central area of connective tissue between astrophysics and geophysics. Astrochemists can explore the gaseous and solid-state forms of progenitor materials, while geochemistry/physics, can explore their disposition within our planet, and potentially others, within the solar system. Foremost among these volatile elements is carbon which presents a major puzzle. In interstellar space nearly half of interstellar carbon is in refractory form and this abundant of carbon is not reflected in the content of terrestrial worlds, in carbonaceous chondrites, or even in the composition of rocky bodies that are revealed when they accrete onto white dwarfs. We present here an interdisciplinary exploration of carbon combining the work of geophysicists and astrochemists to examine the disposition of carbon within the volatility trend seen in many elements; this is often discused as a condensation sequence. In my presentation I will discuss the major carbon carriers within the solar nebular disk with a focus on their sublimation temperature. Of central interest is the sublimation temperature of refractory carbonaceous material, which we will explore. In our discussion, we will also acknowledge the potential for carbon to be sequestered in the Earth's core and we explore the limits set by geophysics on this content. These two facets, sublimation temperature and Earth's carbon content will then be discussed in the context of various formation scenarios for terrestrial worlds.