Mineralogy and petrology of Antarctic meteorite DOM85505, and the relationship of unknown inclusions to the host meteorite

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Meteorites are generally separated into stones, stony-irons, and irons. Stones are composed predominantly of silicate minerals with a small amount of metallic material, irons are composed primarily of nickel-iron metal, and the stony irons are composed of nearly equal amounts of metal and silicate material. Stony meteorites compose the largest number of recovered falls, and are broken into two groups: (1) the chondrites, which represent early solar system material, and are so named due to the presence of rounded droplets of silicate material known as chondrules; and (2) achondrites, which represent younger material that is igneous in nature and has undergone differentiation.

The object of study is an ordinary chondrite, titled DOM85505, which was recovered in the Antarctic. It has inclusions that have been surmised to be achondritic in nature. The goals of this project are to provide a description of the chondritic portion of this meteorite, and to determine the nature of the inclusion material and propose a hypothesis as to its origin.

The study involved detailed petrographic examination and microprobe analysis on five polished thin sections.

The chondritic portion of DOM85505 is a breccia punctuated by rounded chondrules and angular clasts. The chondrite is composed predominantly of olivine, orthopyroxene, small amounts of metal and the iron sulphide troilite, as well as some plagioclase in the microcrystalline groundmass. The inclusion material is mineralogically similar to the chondrite but is texturally different. It is composed of olivine, orthopyroxene and partially isotropic plagioclase, along with minor spinel.

DOM85505 is an LL-type ordinary chondrite, on the basis of its very low total iron content. The petrologic type has been determined to be of type 5 thermal metamorphism. The inclusion material is not achondritic, but rather represents host chondrite material that has undergone melting and recrystallization. There have been two distinct shock events that have shaped this meteorite. The first event generated the impact melt, which was subsequently incorpo-

rated as inclusion material along with unshocked chondritic material to form DOM85505. The breccia was shocked again at a lower pressure, producing features such as shock veining and planar fractures. It is in this form that DOM85505 found its way to Earth.