SPECTROSCOPY OF CARBONACEOUS MATTER IN THE SARICICEK METEORITE.
M. Yesiltas1, T. D. Glotch2, S. Jaret3, A. B. Verchovsky4, R. C. Greenwood2, 1Faculty of Aeronautics and Space Sciences, Kirkkareli University, Kirkkareli, Turkey 39100 myesiltas@knights.ucf.edu, 2Department of Geosciences, Stony Brook University, Stony Brook, NY, USA 11794, 3Department of Earth and Planetary Sciences, American Museum of Natural History, New York, New York 10024, 4Planetary and Space Sciences, Open University, Walton Hall, Milton Keynes MK7 6AA, U.K.

Introduction: On the late night of September 2, 2015, the Sariçiçek (SC) meteorite fell in the village of Sariçiçek, Bingöl, Turkey. The fall of SC was captured by several cameras in the region, which enabled the recovery of many fragments. Thus far, more than 340 pieces of the meteorite have been recovered from the streets and fields in the Sariçiçek village, totaling to a mass of ~15.24 kg. As of today, this meteorite is the newest howardite and the only confirmed fall among the 17 known howardites. In this work, we investigated the molecular constituents of the SC meteorite samples. We present, in addition to O and C isotopic data, mineralogy and carbonaceous content of the SC fragments with three different sets of infrared data and one set of Raman data.
Carbonaceous matter on 4-Vesta is foreign material, perhaps delivered through impacts by micrometeorites or larger objects. The dark material on Vesta may indicate the presence of impact melts and exogenous carbonaceous material [1]. Therefore, carbonaceous phases present in the SC samples might provide clues regarding the impactor material (e.g. carbonaceous chondrites).

Samples and Methods: Various pieces of the SC meteorite were prepared in the form of powder as well as thin sections, which were then studied using (i) synchrotron-based FTIR spectroscopy, (ii) micro-FTIR spectroscopy spanning mid- and far-infrared regions, (iii) micro-Raman imaging spectroscopy. The collected data provide spectral and spatial information on the chemical constituents and various phases present in the studied fragments. C- and O-isotopic composition of the samples have also been investigated.

Results and Discussion: The Δ17O values for the SC fragments are all close to each other, being -0.235 ‰, -0.242 ‰, and -0.235 ‰ for SC15, SC21, and SC183, respectively (Fig. 1). The mean Δ17O value for the three SC fragments is -0.237 ‰, which is within error of the mean value for eucrite and cumulate eucrite falls and finds of -0.240 ± 0.018 (2σ) obtained by [2]. This indicates that the SC meteorite is a normal member of the HED suite and that any carbonaceous chondrite-related component that may be present has had a negligible effect on its oxygen isotope composition. Infrared spectra of the three SC samples display a set of prominent silicate peaks that are mostly due to pyroxene (clinopyroxene and orthopyroxene), with some contribution from Mg-rich olivine. The IR maps show locations of forsterite, fayalite, ilmenite, plagioclase, and enstatite. Raman spectra show that the samples are dominated by augite, diopside, enstatite, kanoite, rhodonite, and ferrosilite, with minor contribution from olivine, plagioclase feldspars anorthite and labradorite. C-isotopic measurements show that there is indigenous carbon in the SC fragments studied here. Raman peaks of carbon (D- and G-bands) indicate heterogeneously distributed graphitic domains in the sample. Comparison of Raman spectral characteristics of our data with other meteorites indicate that the carbon in SC seem to fall near that of type 2-3 chondrites reported by [3] and [4]. Although we note that these comparisons are only qualitative and by no means unambiguous.


Fig. 1. Left: O-isotopic data of SC samples compared with other HED meteorites. Right: Visible micrograph of a carbonaceous phase in one of the SC fragments.