**TRACKING THERMAL ALTERATION OF ORDINARY CHONDRITES VIA RAMAN SPECTROSCOPY OF CARBONACEOUS MATERIAL.** J.M. Young[1] and T.D. Glotch[1], [1]Stony Brook University – Department of Geosciences – 255 Earth and Space Sciences, Stony Brook, NY 11790 (jordan.young@stonybrook.edu)

**Introduction:** Recently, Raman spectroscopy has been used to observe the spectral characteristics of the carbonaceous component within chondritic materials. Spectral properties gleaned from these experiments, along with a sample's given petrologic type have been used to track the thermal history of a given chondrite. These studies have mainly focused on carbonaceous chondrites, specifically those with petrologic types 3.0-3.9[1, 2, 3,]. While some attention has been given ordinary chondrites, mainly the unequilibrated ordinary chondrites (UOC's) with petrologic type 3.0-3.9, little has been given to the thermally altered ordinary chondrites in the 4-7 petrologic type range However, ordinary chondrites are the majority of collected falls and there are satisfactory amounts of carbonaceous material within these meteorites for Raman analyses. This provides an opportunity to conduct a comprehensive survey of the spectral properties of carbonaceous materials in chondrites that have undergone varying degrees of thermal alteration and to understand the relationship between spectral properties and metamorphic grade.

**Methods:** This study was conducted using a WiTEC alpha300R confocal Raman imaging system, coupled with a 512 nm Nd: YAG laser. A 50x (NA 80) objective was used to view samples. Several spatially separated 2-D intensity distribution maps were collected from each sample. These maps were collected using laser power of 1.3 mW, image areas of 50x50 µm and an integration time of 0.1 s in order to minimize the occurrence of sample damage by heating. For a collected 2-D intensity distribution map, each pixel has an associated Raman spectrum. Several hundred spectra

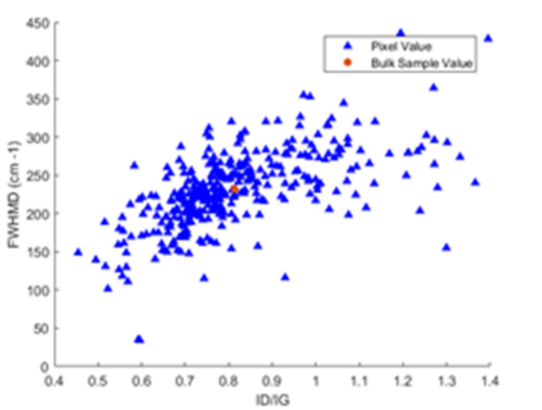


Figure 1. $FWHM_D$ vs. $I_D/I_G$ for individual pixel spectra; Average bulk sample value also plotted [4].

associated with pixels of high intensity for the D & G carbon bands (1375 $cm^{-1}$ and 1575 $cm^{-1}$) were extracted from the maps. Collected spectral parameters from these pixels were then averaged to yield a bulk value for a given sample, as shown in Figure 1.

**Results:** Initial observations, which can be seen in Figure 2., show that the average ratio between the intensity of the D and G Raman carbon bands within a given petrologic type is inversely correlated with the petrologic type itself. This ratio, which is a measure of the graphitic ordering of a population of carbonaceous materials decreases, (becomes more graphitic) with increasing petrologic type and by proxy thermal alteration. Individually, however, there is variability in the $I_D/I_G$. Redox state of carbonaceous materials has observed to be a control on the value of this ratio [5]. Future work will seek to constrain redox properties of carbonaceous materials by using XANES and XAFS spectroscopy methods.

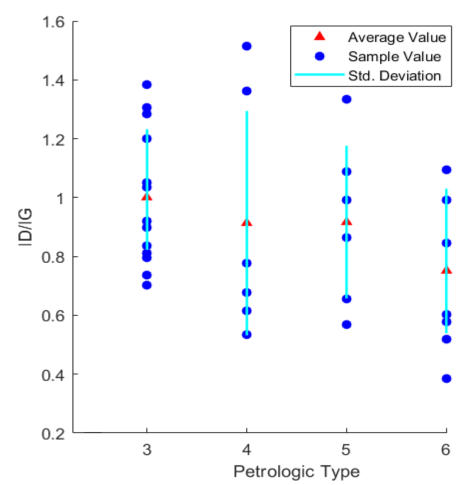


Figure 2. $I_D/I_G$ vs. Petrologic type; Individual sample values plotted with average values for petrologic types 3-6 [4].

**References:** [1] Chanet al. (2015) *AbsciCon* [2] Cody et al. (2008) *EPSL, 272*, 446-455. [3] Ronal et al. (2016) *GECA*, *189*, 312-337. [4] Young et al. (2018) *LPSC 49*. [5] King et al. (2016) *NSR*, 6, 1-6.