OLIVINE IN CV CHONDRITE MATRICES:STRUCTURE, SIZE-DISTRIBUTION AND MORPHOLOGY. L. E. Watt[1], P. A. Bland[1], D. J. Prior[2] and S. S. Russell[3]. [1]IARC, Dept. Earth Science & Engineering, Imperial College, London SW7 2AZ, UK. (lauren.watt@imperial.ac.uk). [2]Dept. Earth & Ocean Sciences, University of Liverpool, 4 Brownlow Street, Liverpool L69 3GP, UK. [3] IARC, Dept. Min., Natural History Museum, London SW7 5BD, UK.

Introduction: The CV3 chondrites were originally divided into the oxidized (CV_{ox}) and reduced (CV_R) subgroups based principally on their modal metal/magnetite ratios and the Ni content of the metal and sulfides [1]. Later studies [e.g. 2] have shown that the oxidized CV3s can be divided into two additional subgroups, Bali-like (CV_{oxB}) and Allende-like (CV_{oxA}), each showing characteristic alteration features. These divisions are thought to be correlated to the degree and temperature of aqueous alteration experienced by these meteorites [3].

Methodology: Recent work by Watt et al. [4] has shown that olivine crystallography is related to its formation mechanism, concluding that the short a-axis crystal morphology for Allende (CV_{oxA}) matrix olivine is consistent with a formation by dehydration of phyllosilicates. In this study we have used electron backscatter diffraction (EBSD) to analyze olivine in the matrices of a variety of CV3 chondrites, in order to determine if there is a systematic variation between the different subgroups. We have determined grain size distributions, crystal structure data and olivine morphology ratios. Meteorites analyzed include: CV_R= Vigarano, Leoville & Efremovka; CV_{oxB} = Bali, Kaba & Mokoia; CV_{oxA} = Allende, Axtell & ALH84028.

Results: Analysis of our data highlights the following:

1. *Grain Size Distributions*: Cumulative grain size frequency plots reveal that the CV_{oxB} meteorites have similar distribution trends, while the CV_R meteorites appear to differ; CV_R distributions can be approximated by an appropriate power law, while CV_{ox} distributions cannot.
2. *Olivine Crystal Structure*: Where crystal structural data can be determined (i.e. in euhedral, lath shaped olivine), there is a consistent short a-axis crystal morphology for the olivine in the matrices of the CV_{ox} meteorites. This differs to the CV_R meteorites, where there is an inconsistent crystal morphology, with examples of short a, b and c axes observed.
3. *Olivine Morphology:* There is a systematic change in the ratio of euhedral laths (aspect ratio >2) to sub/anhedral grains between the 3 groups; CV_R~<20%, CV_{oxB}~20-25%, CV_{oxA}~25-35%.

Conclusions: There is a systematic variation in matrix olivine between the different CV3 subgroups, particularly between the CV_{ox} and CV_R subgroups. We propose that the variations in olivine characteristics, between the different subgroups, are related to the formation mechanisms by which the olivine has formed. The occurrence of abundant, euhedral, lath-shaped fayalitic olivine with consistent short a-axis crystal morphology and a characteristic grain size distribution in the matrix of the CV_{ox} meteorites can be attributed to a formation mechanism of dehydration of phyllosilicate [4]. It would appear that the CV_R subgroup has largely escaped these processes.

References: [1] McSween, H. Y. 1977. *GCA* 41:1777-1790. [2] Weisberg, M. K. et al. 1997. *MAPS* 32: A138-139. [3] Krot, A. N. et al. 1998. *MAPS* 33:1065-1085. [4] Watt, L. E. 2005. *LPSC XXXVI*: # 1305.