INSIGHTS ON CHONDRULE FORMATION FROM ELECTRON BACKSCATTERED DIFFRACTION OF CHONDRULE METAL LAYERS IN ACFER 139 (CR2).

E. J. Crapster-Pregont[1,2], W. H. Towbin[3], and D. S. Ebel[1,2]. [1]Lamont-Doherty Earth Observatory, Columbia University, Palisades, NY, 10964, USA (ellencp@ldeo.columbia.edu). [2]Dept. of Earth and Planetary Science, American Museum of Natural History, New York, NY, 10024, USA. [3]Microscopy and Imaging Facility, American Museum of Natural History, New York, NY, 10024, USA.

Introduction: Carbonaceous, Renazzo-type (CR) chondrites contain high modal abundances of chondrules; many of them with distinct metal layers, making them ideal for providing constraints for chondrule formation hypotheses [1]. These metal layers have been studied before but not systematically focusing on crystallographic orientation and texture in relation to chondrule classification. Electron backscattered diffraction (EBSD) is a minimally destructive technique that quickly reveals crystallographic information. When coupled with elemental abundances measured by energy-dispersive spectrometry (EDS), EBSD becomes a powerful tool capable of putting constraints on chondrule formation. Acfer 139 (CR2) is used in this study as it is a minimally altered find and has been investigated previously with the aforementioned techniques [2-4].

Method: Epoxy embedded serial sections of Acfer 139 (AMNH 4793-t2) were polished as described by [3]. Orientation data was obtained using an EDAX DigiView IV electron backscatter diffractometer and further analysis conducted using EDAX OIM and EDAX TEAM sofware to create orientation maps and point analyses. The EDAX TEAM software uses simultaneous EBSD and EDS data to provide orientation and elemental information. Both the EBSD and EDS are attached to a Zeiss variable-pressure EVO 60 scanning electron microscope which permits analysis without use of a carbon coat.

Discussion: Initial investigations focussed on a layered chondrule with several concentric metal layers originally described by [5]. Preliminary EBSD data shows that each layer has distinctive characteristics. Observations include: size of metal nodules, number of metal grains per nodule, and twinning.

Detailed post-processing reveals two primary metal twinning planes: (111), crystallization related, and (112), which could be associated with deformation. More investigation is required to determine whether these are Neumann lines as described by [6]. This will add constraints to chondrule deformation history. Comprehensive analysis of metal layers and comparison to their associated chondrule type in multiple chondrules aids in constraining the conditions of sequentially forming igneous chondrules in the early solar system.

Acknowledgments: Research and EBSD acquisition is supported by NASA Cosmochemistry grant NNX-10AI42G (DSE) and the National Science Foundation Graduate Research Fellowship Program (DGE-11-44155) (ECP).

References: [1] Wood J.A. 1963. *Icarus*, 2:152-180. [2] Weisberg M. K. et al. 2006. *Meteorites and the Early Solar System II, Univ. Arizona Press*, 19-52. [2] Crapster-Pregont E.J. et al. 2015. *LPS XLVI*, Abstract #1561. [3] Hobart K.K. et al. 2015. *LPS XLVI*, Abstract #1978. [5] Ebel D. S. and Downen M. R. 2011. *Meteoritics Planet. Sci. Suppl., 46,* A62. [6] Ramdohr P. (1973) *The Opaque Minerals in Stony Meteorites, Elsevier*, 245p.