

**A NEW CLASSIFICATION SCHEME FOR CHONDRULES BASED ON VERY DETAILED STUDY OF SARATOV.**

R. K. Herd<sup>1,2</sup>, L. Dixon<sup>2</sup>, C. Samson<sup>2</sup>, P. A. Hunt<sup>1</sup>. <sup>1</sup>Natural Resources Canada, Ottawa, Ontario K1A 0E8 ([herd@nrcan.gc.ca](mailto:herd@nrcan.gc.ca)).

<sup>2</sup>Department of Earth Sciences, Carleton University, Ottawa, Ontario K1S 5B6.

**Introduction:** Chondrule mineralogy and textures in polished thin sections and slabs of Saratov (L4) have been studied using a scanning electron microscope (SEM) and optical microscopy. The most detailed work so far [1] has mapped the size, sorting, packing, mineralogy and textures of 370 chondrules in a single thin section.

**Background:** Accepted and long-standing descriptive schemes for chondrules obscure relevant data by placing them in a few categories that highlight their obvious features, or their chemistry, but ignore abundant minor petrographic features that provide invaluable data and insights into chondrule petrology. Templates to organize detailed textural and mineralogical observations on chondrules are lacking.

**Methods:** Using back-scatter electron (BSE) images, Herd et al. [2] created a digital photomosaic of an entire thin section of Saratov, and described 19 chondrules with archetypical or atypical textures. This photomosaic was overlain with a 2.5 mm<sup>2</sup> grid system; the grid was related to the thin section to locate and map all chondrules > 100 microns [1]. Textures and mineral phases were investigated with BSE images, energy dispersive spectrometry (EDS) and cathodoluminescence (CL). Descriptive work on the original 19 chondrules was used to develop a simple mineralogical-textural classification scheme based on crystal geometries and sizes. After testing and refinements this scheme, based on a series of easy-to-use illustrated classification flow charts, successfully described the 370 mapped chondrules. Igneous and metamorphic textural analogs that may provide insight into the formation and history of groups of chondrules were noted. The size, sorting, packing and shape of all the mapped chondrules were documented.

**Some Results:** The average chondrule size is 0.7 mm. Nearly 50% were considered fragments that may have been recycled or broken down prior to incorporation into the host chondrite. They were judged to be poorly sorted and the chondrite weakly compacted, sharing many common features with terrestrial breccias. Mineralogically the chondrules are composed of unzoned olivine (Fa<sub>21-26</sub>), zoned pyroxenes (low-Ca and more Ca-rich varieties) with minor plagioclase, Fe-Ni, phosphates, sulphides, chromite and spinel [1,2]. Because of its emphasis on crystal geometries and size, the new chondrule classification scheme successfully discriminated among those that would be grouped together under currently used schemes. The original 19 chondrules were subdivided into four textural groups interpreted to show slow cooling, quenching, multi-stage cooling, and annealing, respectively. These groupings need to be extended to all the other mapped chondrules to likewise help understand their petrology and to gain an overall perspective of these processes in the origin of Saratov and its chondrules.

**References:** [1] Dixon, L. 2009. B.Sc. thesis Carleton University, 133 pp. [2] Herd, R. K. et al. 2004. Abstract #2070. 35<sup>th</sup> Lunar & Planetary Science Conference.