## MINERALOGICAL STUDY OF A WHITE CLAST FROM MURCHISON (CM2): COMPARISON WITH R-CHONDRITES

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**Introduction:** R-chondrites share some properties with ordinary chondrites (OC) and carbonaceous chondrites (CC). The proportions of the textural types of chondrule from R chondrites and their FeO/(FeO+MgO) ratios are similar to those of OC, but the high matrix abundance in R chondrites more closely resembles that of CC (matrix abundances: OC ~12 vol% vs. CC 34—>60 vol%; [1-5]). In this study, we characteristize the mineralogy of a white clast from Murchison (CM2), which was earlier considered to be a R-chondrite [6]. First, all the petrographic and mineralogical characteristics will be described and compared with those of R-chondrites [7,8]. Finally, all data will be considered in order to test, whether this clast is a real R-chondrite or a unique recrystallized chondrite?

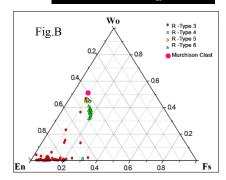
Analytical methods: A polished thick section of Murchison was used for this study. Backscattered electron (BSE) imaging was performed with scanning electron microscope. Mineral compositions were measured using a electron microprobe. The modal abundances of the clast, were determined on the thick section using the open source image processing program "ImageJ" [9]. Each component was precisely thresholded based on its grey value on BSE images and the corresponding area% measured. Bulk compositions were determined using modal recombination following the protocol of [10,11].

**Petrography and mineralogy:** The studied section with the white clast comprised two areas with a granular texture: (a) a coarse-grained (grain size:  $\sim 200$  µm) and (b) a fine-grained area (grain-size:  $\sim 20$  µm). Both areas show a well-recrystallized chondritic texture. The olivine and Ca-pyroxene grains are equilibrated in the whole clast, while the plagioclase and sulfides do show some variations within the two domains (Fig. A).

The dominant phase is olivine ( $\sim$ Fa<sub>38</sub>;  $\sim$ 54 vol%). Ca-rich pyroxene (diopside,  $\sim$ Fs<sub>10</sub>Wo<sub>50</sub>; 16 vol%), plagioclases (14 vol%), and sulfides ( $\sim$ 13 vol%) are also abundant. The plagioclases are somewhat unequilibrated  $\sim$ An<sub>32-45</sub>. Some nepheline has been analyzed. As sulfides pyrrhotite (or troilite), monsulfide solid solution and pentlandite were found. In the coarse-grained areas mainly Fe-rich sulfides occur, while the dominant sulfides within the fine-grained areas are rich in Fe, Ni, and S. Cr-spinel (2 vol.%) are the only oxides and one grain of amphibole (Fe#=0.57) was detected. No metals are found.

**Discussion and conclusions:** Based on the mineralogy it is unlikely that the white clast is a R-chondritic fragment as suggested by [6], because:

(1) The clast contains olivine with low NiO (~0.1 wt%); this clearly is below the normal value for equilibrated R-chondrites (>0.3 wt%). (2) The fragment contains abundant diopside, unlike normal R chondrites (Fig. B). (3) Plagioclases are unequilibrated and often An>30, which is not consistent with typical plagioclase from R-chondrites [7]. (4) Oxygen isotope analyses clearly show that the clast is not related to R chondrites [12]. Additionally, the clast is of high petrologic type and appears relatively unshocked. Probably, it was thermally metamorphosed in a different environment prior to incorporation into the Murchison parent body. According to [6] it was – if at all – only slightly affected by alteration on the Murchison parent body.



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