

**CHLORINE IN THE PARIS CM: A PRELIMINARY STUDY**

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**Introduction:** Paris is a recently discovered CM chondrite with moderate aqueous alteration compared to other CM2 [1]. This specimen is presently studied by a consortium and we were allocated section 2010-6 by MNHN Paris. Here we focus on the abundance and distribution of chlorine in this sample compared to Mighei (MNHN section 2008-42) and Cold Bokkeveld (MNHN section 2010-16). The abundance of chlorine in CM chondrites is highly variable and poorly understood. This work is part of a more comprehensive survey of halogens in CMs.

**Analytical techniques:** In this first approach we performed SEM imaging and EMP analyses. In addition, chemical maps by EDS and WDS allowed characterizing the chlorine distribution.

**Results:** EMP analyses in raster mode over areas of 100 x 100 micrometers yields the following average abundances : 1160 ( $\pm 240$ ), 1620 ( $\pm 230$ ) and 830 ( $\pm 180$ ) ppm ( $\pm$ variability for 10 points) for Paris, Mighei and Cold Bokkeveld respectively. EDS chemical mapping is consistent with EMP results. For Paris, it indicates that olivine, troilite and kamacite are chlorine free, while there is a low chlorine background of about 1200 ( $\pm 600 = 2\sigma$ ) ppm in the fine matrix and a few hotspots with several wt % Cl are. These hot spots correspond to tochilinite patches surrounded by cronstedtite.

This distribution contrasts with that observed in both Mighei and Cold Bokkeveld in which a chlorine background is present at the level of 1600 ppm Cl and 800 ppm Cl respectively. In Mighei hotspots are absent but in Cold Bokkeveld, rare halite crystals of a few micrometers can be found. We did not find the Cl-tochilinite which appears to be specific of Paris.

Spot analyses of the Paris tochilinite indicate a variable Cl concentration from 1.0 to 3.7 wt %. When tochilinite is more closely associated with cronstedtite, the Cl content falls to an average of 5000 ppm and can be as low as 1000 ppm.

**Conclusions:** In situ analyses yield high chlorine values compared to all previous values obtained from bulk chemical analyses. For instance mean CM composition is given at 160 ppm Cl [2]. The presence of significant amounts of chlorine in tochilinite is, as far as we know of, specific of Paris and may explain its high chlorine abundance. The low level from bulk analysis may be due to high chlorine mobility in aqueous fluids.

**References:** [1] *Meteoritical Bulletin* 97 [2] Wasson J.T. and Kallemeyn G.W. 1988 *Philosophical Transactions of the Royal Society of London A*, 325, 535.