Heating Experiments of sideritic sedimentary rock as a possible martian sediment: Can this rock survive a flash heating when it enters the earth's atmosphere?

Sz. Nagy[1], S. Józsa[2], H. Nishido[3]

[1]Seismological Observatory, Department of Mineralogy, Meredek u. 18., H-1112 Budapest, Hungary. (e-mail: ringwoodite@gmail.com), [2]Eötvös University, Department of Petrology and Geochemistry, Pázmány Péter sétány 1/c., H-1117 Budapest, Hungary.[3]Okayama University of Science, Department of Biosphere-Geosphere Science, 1-1 Ridaicho, 700-0005, Okayama, Japan

Recently, the formation mechanism of iron oxide hematite and Mg- and Fe-rich carbonates have been extensively investigated to clarify the interaction of liquid water on the Martian land for the search of habitable environments. The unsolved issue on this matter is whether or not candidate minerals can survive a severe condition during a flush heating when entering into the atmosphere (e.g., STONE experimental series [1,2]). In this study we have conducted heating experiments of Fe-rich carbonates for the verification of their survival at high temperature and the detection of characteristic textures formed in a heating process.

According to Morris et al. [3], the sideritic carbonates (magnesium-iron carbonate) could be present on the surface of Mars. Therefore, we propose an experiment series upon sideritic rock samples to understand its behavior under high temperature, and employed three procedures of the heating up to 2000°C with various during time possibly related to the size of the meteorite. In this case, the experiments were carried out under pressure of the ambient atmosphere and allowed to cool without any control of quenching. The recovered samples were observed using conventional optical techniques and analyzed using EPMA and Raman spectroscopy to characterize the textures and the phases.

The heating of the sample for 1 hour shows that the carbonate lost its full CO_2 content above around 400°C, and became opaque oxide material (hematite). Because of the slow heating the recovered sample contains only few cracks inside, suggesting the phase transition happened slowly ongoing forward. When heating for 6 minutes, the recovered sample represents almost same process like the previous behavior, but the difference in the texture ascribed to opaque materials as concentrated to the outer part along the newly formed cracks. It might be characteristic in the feature at the "burned" stage, impling the inhomogenic distribution of temperature through the sample. The 20 seconds duration made the heating impulse on the sample, of which surface was changed drastically. The remarkable difference compared to the other cases is the separation of the outer layers closely associated with wide cracks of 50-200µm from the core region**.** These cracks parallel with the sample surface might run through the heated area over the surface. At the outermost exposed area, the time was enough to produce the melts as metallic texture after cooling (Fig. 1)**.** This behavior during a rapid heating possibly simulates the ablation of the meteorite surface in the process of when entering the atmosphere.

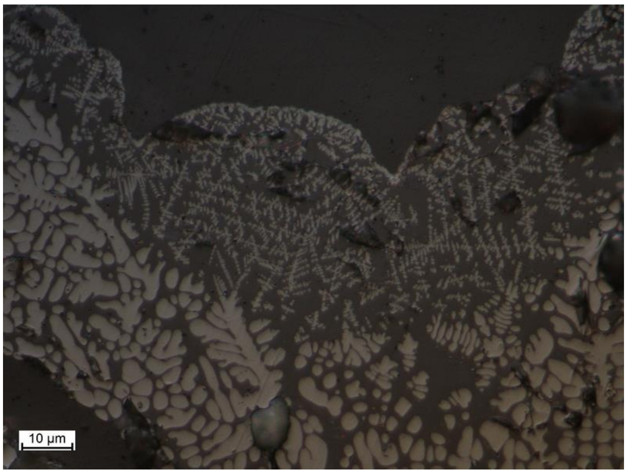

Fig. 1 The strongest affected area by the heating. The well developed metallic texture shows evidence for a melting process and rapid cooling. (reflection OM-image).