ALTERATION IN CR CHONDRITES: AN ANALOGUE FOR THE LONG TERM STORAGE OF NUCLEAR WASTE

A. Morlok[1,2] G. Libourel[1,3] [1]CRPG-Nancy Université-INSU-CNRS, UPR2300, BP 20, 54501 Vandoeuvre-lès-Nancy, France. [2]ANDRA-DS/CM, 1/7 rue Jean Monnet, 92298 Châtenay-Malabry France. [3]ENSG-Nancy Université, 54500 Vandoeuvre-lès-Nancy, France. <amorlok@crpg.cnrs-nancy.fr>

Introduction: As part of a study to study the corrosion of nuclear waste glass over a longer (>10^5 years) time frame, we use aqueous alteration features in CR chondrites asanalogue. CR chondrites were selected because there are samples available in all stages of aqueous alteration, from type 3 to 1[1-3]. This allows the study of even very long term effects of corrosion (>10^7 years, [4]) of metal and glass. They also contain abundant components (metal, glass) useful as analogues for the nuclear waste glass material in steel containments. In our study, we mainly focus on three interfaces:

- mesostasis/ FeNi metal *as analogue for* the contact between the nuclear glass and the container,
- FeNi metal/matrix, for steel containment in clay environment
- mesostasis/phyllosilicates for glass/alteration products.

Samples and Techniques: To cover the whole range of alteration processes expected, we selected a series of CR chondrites. Renazzo, Al Rais (both CR2) and GRO 95577 (CR1) will be the focus of the study.

Samples were mapped using an SEM in BSE mode. Based on these maps, we selected interesting alteration structures for quantitative elemental mapping and point analyses using an EMPA at Nancy University. We will present an overview of changes in chemical composition and mineralogy of the interfaces at different stages of alteration.

Discussion:

Al Rais turns out to show abundant features of varying degrees of alteration even in one sample, indicating many microchemical environments. Renazzo is on the whole less altered, and shows less variance.

Alteration at the glass/metal interface around metal grains in mesostasis is already widespread in Renazzo.

In Al Rais, heavily corroded metal grains in chondrules are also common.

The clay/metal interface in Al Rais usually shows incipient alteration, and often already layered corrosion rims around larger metal grains in the fine-grained matrix of Renazzo and Al Rais.

Also, structures in the fine-grained matrix in Al Rais give insight in the later stages of alteration: Fe and S enriched areas around a chondrule indicate sulfide precipitation from dissolved species.

Furthermore, abundant fine-grained intergrowths of iron-oxides and carbonate seem to have isomorphically replaced silicates in remnants of completely altered chondrules. Carbonates were also observed around chondrules in earlier studies [1].

Future work will include detailed mineralogical studies (e.g. TEM), as well as isotopic analyses to trace the elemental dispersion during alteration processes.

References: [1] Weisberg et al. 1993 *Geochimica et Cosmochimica Acta* 57 1567-1586 [2] Abreu 2007, PhD thesis [3] Weisberg M.K. and Huber H. 2007 *Meteoritics & Planetary Science* 42:9 [4] Hutcheon et al. (1999) *Lunar planet. Sci.* **XXX**, #1722,