**Signs of regolith recycling on the parent asteroid of the dehydrated CM chondrites? Solar and cosmogenic noble gases in Y-793321, A-881458 and Diepenveen*.** M. M. M. Meier[1,2], K. C. Welten[3], K. Nishiizumi[3], W. van Westrenen[4], M. Langbroek[4], [1]Centre de Recherches Pétrographiques et Géochimiques, CNRS Nancy, France, [2]Earth Sciences, ETH Zurich, Switzerland, [3]Space Science Laboratory, University of California in Berkeley, USA. [4]Earth & Life Sciences, University of Amsterdam, Netherlands.

**Introduction**

Dehydrated CM chondrites (also called thermally metamorphosed CM chondrites) are a subgroup of CM chondrites characterized by the presence of decomposed phyllosilicates. Meteorites within that grouplet include, among others, Y-82162, Y-86720 and Belgica [1]. Nakamura [2] analyzed seven dehydrated CM chondrites and identified two "regolith breccias" among them, Y-793321 and A-881458. These meteorites stand apart from the other dehydrated CM chondrites by having e.g. a brecciated texture and showing the presence of solar-wind-derived noble gases. This and their similar spectroscopic properties make them candidate analog materials for the surface of C, B, G and F-type asteroids, e.g., Ceres and Pallas [1]. Here we report the results of a noble gas analysis of the Diepenveen* (dehydrated CM) meteorite, which was first observed to fall in 1873, transferred into a school collection and lost for many years. A few years ago, the meteorite was identified in a private collection and subsequently donnated by the owner to the Dutch Natural Museum of Natural History in Leiden [3]. While the aim of this analysis is the determination of a cosmic-ray exposure (CRE) age for the meteorite, as well as an estimate of its pre-atmospheric size, we focus here on the trapped (solar) noble gas inventory, which shows intrigueing similarities and differences to the other two dehyrated CM regolith breccias Y-793321 and A-881458.

**Samples and Methods**

For the noble gas analysis, a piece of Diepenveen* of 63.7 mg total mass was broken into two smaller pieces of 43 mg and 20.7 mg, respectively. These samples were then weighted on a microbalance, wrapped in Al-foil, loaded into a sample holder within the extraction line of custom-built noble gas mass spectrometer at ETH Zurich. The extraction line was then heated externally to 120°C (to remove adsorbed atmospheric gases on samples and chamber walls) and pumped to ultra-high vacuum during 72 hours. Extraction of He, Ne, Ar, Kr, Xe was then done by pyrolysis (at 1800°C) in a resistance-heated Mo-furnace, and the analysis performed based on a protcol originally developped by [4]. Blanks were measured and found to contribute significantly to the signal for Ar, Kr, Xe. For He and Ne, the blank contributions are insignificant. Therefore, we will focus on the discussion of He and Ne. The measured signal was corrected for interferences from $H_2O$ and doubly-charged $^{40}Ar$ on mass 20, and doubly-charged $CO_2$ on mass 22, however these corrections proved to be smaller than the ion counting error in all cases.

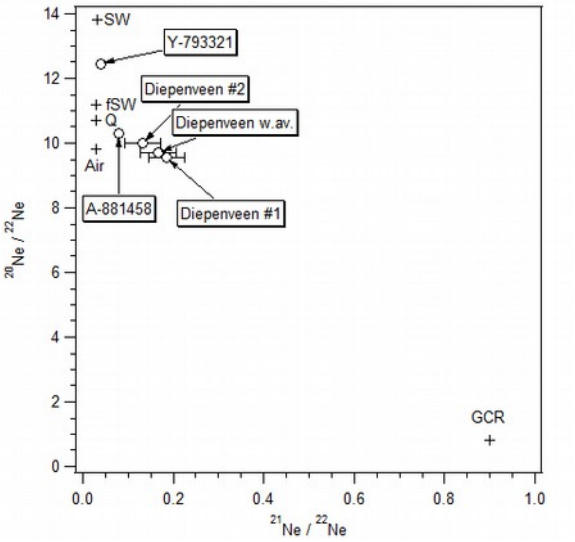


*Fig. 1: Neon-three-isotope diagram for both pieces of Diepenveen and the two dehydrated CM chondrite regolith breccias identified by [2].*

**Results and Discussion**

The data points of Diepenveen, as well as the data point for A-881458 plot on a line connecting the cosmic-ray-produced component (GCR in Fig. 1) with a trapped component enriched in $^{20}Ne$ relative to the Earth's atmosphere. The measured Ne isotopic ratios are compatible with both a fractionated solar (fSW, $^{20}Ne/^{22}Ne$ = 11.2) and Q-like end-member for the trapped component. In contrast, the Ne in Y-793321 is clearly solar.

(to be continued)

**"Diepenveen" is the suggested name of the meteorite submitted for approval by the Nomenclature Committee of the Meteoritical Society.*

**References**

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