

COMPARING THE MAGNETIC SIGNATURE OF NWA 5789 AND YAMATO 980459 OLIVINE PHYRIC SHERGOTTITES

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Introduction: NWA 5789 is a new Martian meteorite which was found in 2009 in Morocco and has been classified as an olivine-phyric shergottite [1]. This nicely fusion-crust and fresh meteorite was found to be very similar to Yamato 980459 (Ym98) in terms of mineralogy, chemistry and bulk composition [2], probably both originating from the same lava flow. Like Ym98, NWA 5789 is a very primitive Martian magmatic rock and belongs to the depleted permafic olivine-phyric shergottites according to the new scheme as proposed by [1]. Ym98 was investigated within a NIPR consortium study [3], whereby first results concerning petrography and mineralogy have been reported by [4] and about magnetic signature by [5].

Samples: In order to compare the magnetic signature of both Martian meteorites, we investigated three samples of NWA 5789 (0.2-1.4gr, one exterior fusion-crust, two interior) and four of Ym98 (0.1-0.15gr, all interior).

Magnetic signature: Magnetic susceptibility (MS) has been measured by KLY3 (AGICO). The two interior samples of NWA 5789 gave 2.95 and 2.91 (decimal log [spec. MS 10^{-9} kg/m³]), respectively, while an exterior, fusion-crust slice showed an enhanced log MS value of 3.15. The average log MS value of the four Ym98 chips was found to be 2.72 (ranging from 2.50-2.81). If one compares these MS values with the reported range of known MS from SNC's (\approx 2.79-4.41, [6]) then both meteorites plot in the lower range and fit very well with most other olivine-phyric shergottites. NWA 5789 has a significantly higher MS compared to Ym98. NRM/IRM experiments have been performed on a 2G Cryogenic with attached AF demagnetizer. In case of NWA 5789 NRM and IRM (-0.3T, 1T) intensities are in a similar range (10^{-2} Am²/kg). The REM values (NRM/IRM) clearly point to remagnetization by artificial magnetic fields. As expected, NRM/IRM intensities are higher for the fusion crust sample. The high average S value ($IRM_{0.3T}/IRM_{1T}$) of 0.95 indicates low-coercive magnetic phases as dominating recorders, most likely magnetite-like. The magnetic signature of Ym98 is different showing very low NRM intensities (10^{-4} - 10^{-6}) but IRM lying in a similar range as for NWA 5789, resulting in a very low REM. The Ym98 NRM most likely represents a primary magnetic record of Martian origin. The average S value of 0.68 indicates significant contributions of higher coercive phases such as titanomagnetite and/or pyrrhotite. Supported by high- and low-T experiments, our findings point to significant differences in the magnetic signature of NWA 5789 and Ym98, despite the similarities in mineralogy or chemical composition reported by [1,2].

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References: [1] A.J. Irving et al. 2010. Abstract #1547, 41st LPSC. [2] J. Gross et al. 2010. Abstract #1813, 41st LPSC. [3] K. Misawa 2004. *Antarct. Meteor. Res* 17: 1-12. [4] T. Mikouchi et al. 2004. *Antarct. Meteor. Res* 17: 13-34. [5] V. Hoffmann and M. Funaki, 2006. *XXX Antarct. Meteor.*, 22-23. [6] Rochette et al. 2009. *Meteor. Planet. Science*, 44: 405-427.