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AR-AR AGE AND HALOGEN CHARACTERISTICS OF NAKHLITE MIL 03346: RECORDS OF CRUSTAL PROCESSES ON MARS

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Introduction: MIL 03346 is one of the 7 members of the nakhlite group of Martian meteorites. The texture and mineralogy of this rock distinguishes it from other nakhlites [1]. Almost complete absence of crystalline plagioclase and ferro-hedenbergitic rim on pyroxene phenocrysts are some of the unique characteristics of this sample. Previous Ar-Ar age study of MIL 03346 reported a total Ar-Ar age of 1.37 Ga [2]. Recent reports have also highlighted presence of exotic minerals such as K-Cl-rich amphibole in melt inclusions in pyroxenes and olivines in MIL 03346 [3]. The non-chondritic halogen ratios in nakhlites have been interpreted as a result of fluid activity on Mars [4]. In the present study we have combined measurements of step-heating Ar-Ar ages with that of halogen contents. The work was conducted on ~12 mg whole-rock sample, sliced out from 1g al-location of MIL 03346,37 from the MWG to the senior author.

Results: The total Ar-Ar age is 1360 ± 2 Ma, similar to that re-ported by [2]. The main release of K is between 600-900 ^{o}C and there is a clear decrease in age with temperature, most likely re-coil-related. The major Cl release occurs at around 1000 ^{o}C, is therefore separate from K release, and accompanies the release of Ca from pyroxene. The measured halogen contents in MIL 03346 are high relative to other SNC meteorites, only lower than Nak-hla [4]. The halogen data for MIL 03346 are: Cl = 156 ppm; Br = 0.41 ppm; I = 0.014 ppm. The halogen ratios of Nakhla are slightly higher than MIL (Br/Cl = 0.002; I/Cl = $6x10^{-5}$ but this may be explained by high Br/Cl and I/Cl ratios of martian weath-ering components in alteration veins in Nakhla olivines [5]. For comparison the martian regolith Br/Cl = 0.007 and I/Cl = $16x10^{-5}$ [6] while shergottites are more similar at Br/Cl = 0.005; I/Cl = $3x10^{-5}$.

The presence of K-Cl-rich amphibole in melt inclusions in py-roxene could explain the major Cl release at high temperature and some of the recoil effect if $^{39}Ar_K$ moves from the melt inclu-sions into the pyroxene. Alternatively, $^{39}Ar_K$ may also be re-leased from the mesostasis glass but then we would also expect to see major Cl release at the same time. Between 600-850 ^{o}C 73% of total K and 26% of total Cl are released; >900 ^{o}C the val-ues are 21% and 67%; so the majority of halogen release pre-sumably comes from the melt inclusions. This indicates that the Br/Cl and I/Cl are representative of the melt (although they may originate from a soil contaminated melt).

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