SOLAR GASES IN KAVARPURA IRON METEORITE,
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Introduction: Solar wind (SW) noble gases have been usually found in stone meteorites that are regolith breccias [1]. So far very few stony irons [2] and only Washington County iron meteorite [3] have been found to contain SW noble gases, though several irons have been reported to host primordial noble gases either in the metal [4] or in the inclusions [5]. Kavarpura iron meteorite fell in India on Aug. 29, 2006. Based on Ni, Ir, Ga and Ge contents and the presence of non-metallic inclusions, it has been classified as IIE-Anom. Two adjacent pieces of Kavarpura have been analyzed for noble gases by stepwise heating.

Results: Large amounts of He, Ne and Ar are present in Kavarpura and are found to be a mixture of trapped and cosmogenic components, while Kr and Xe are close to blank levels, due to small amounts of samples used. The highest measured $^{20}Ne/^{22}Ne$ ratio is 12.47 and in Ne three isotope plot the data fall along the SW-cosmogenic mixing line. Using the cosmogenic He, Ne and Ar systematics of iron meteorites [6], we have calculated the trapped and cosmogenic gas amounts in the two samples 1 and 2 of Kavarpura, and they are (in 10^{-8} ccSTP/g units) respectively $^{20}Ne_t$: 209 and 58; $^{21}Ne_c$: 6.2 and 6.1. The elemental ratios in both samples are indistinguishable with $(^4He/^{20}Ne)_t$ ~ 500; $(^{20}Ne/^{36}Ar)_t$ ~ 20; $(^3He/^{21}Ne)_c$ ~50 and $(^{38}Ar/^{21}Ne)_c$ ~ 4.3.The peak release of trapped gases occurred at 800^{o}C, while that of cosmogenic gases occurred at 1600^{o}C. The two adjacent samples differ by about a factor of four in their trapped SW component, clearly suggesting that the trapped gases are likely present in some inclusions that are inhomogeneously distributed and not hosted in the metal phase. Using $(^{38}Ar/^{21}Ne)_c$ as shielding parameter [6], we calculated the production rate of P_{21} and an exposure age of 272 Ma.

Discussion: BSE images of a polished surface of Kavarpura have revealed the presence of inclusions of up to several hundred microns in size. EDX spectra have shown the presence of C (in some), Si, Cr, Mg, Al and Ca in most of these inclusions. Peak release of SW gases at 800^{o}C and cosmogenic gases at 1600^{o}C (from the principal target phase, metal) suggest that the SW gases are not volume correlated in the metal; they are either hosted in a non-metallic phase with low thermal stability (if volume correlated) or the surface sited SW gases in this host phase are not disturbed during the formation of the parent body of Kavarpura. A nonmagmatic origin has been proposed for IIE irons [7]. The survival and low temperature release of SW gases from Kavarpura imposes severe constraints on the formation conditions of its parent body. Formation of IIE irons in a local melt pool by the impact of a body into a regolith and survival of the SW bearing inclusions without any appreciable noble gas elemental fractionation are required to explain the Kavarpura data. This requires intact survival of volatiles in the inclusions trapped in IIE irons.

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