NOBLE GAS ANALYSIS OF Q-RICH FRACTIONS FROM SARATOV (L4).

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Introduction: Q, for quintessence, is the phase that contains the majority of heavy noble gases in primitive chondrites [1]. It is most likely carbonaceous [2, 3], but the exact nature remains elusive. Q-gases in various compositional and petrologic types of chondrites have been extensively studied [4-8]. Q is less susceptible to thermal metamorphism than presolar diamond [6]. Therefore, chondrites with a higher petrologic type may contain Q, but not diamond. Saratov (L4) indeed contains Q, but is devoid of diamond [8], making it possible to study Q and Q-gases without the effect of diamond. As ongoing effort to isolate and identify Q, we further separated the Saratov fraction AJ [9] and analyzed noble gases in the separated fractions.

Experimental: Colloidal separation was carried out on AJ. Subsequently, the non-colloidal fraction AL was separated by density using sodium polytungstate [$Na_6(H_2W_{12}O_{40})$], yielding 7 density fractions, AM, AN, AO, AP, AQ, AR, and AS with the density ranging from 1.26 to > 2.5 g/cm^3. The abundance of AO (2.11 – 2.16 g/cm^3) is 93 ppm relative to the bulk meteorite and AO comprises 38 % of the parent fraction AL. Noble gases of these separated fractions were analyzed with two temperature steps, 800°C and 1600°C, using the high-sensitivity noble gas mass spectrometer SuperGnome. Typical ^{132}Xe blank was 5×10^{-14} cm^{3}STP. The majority of Xe (≥ 93 %) was released in the 1600°C fractions, indicating the Xe was mostly from Q.

Result and Discussion: AO (2.11 – 2.16 g/cm^3) and AP (2.16 – 2.23 g/cm^3) show the highest ^{132}Xe concentrations, 6.95×10^{-7} and 6.98×10^{-7} cm^{3}STP/g, respectively, among the fractions analyzed. We lost heavy noble gases in the 1600°C fraction in AM. Excluding the Xe in AM, AO contains about half of the Xe in AL. It has also been seen in Allende (CV3) that half of the Xe in the parent fraction is contained in one fraction, C1-8D, after density separation [10]. However, the difference is that the density of Allende C1-8D (1.65 ± 0.04 g/cm^3) is much lower than that of Saratov AO. It may indicate that Allende Q is different from Saratov Q.

The ^{20}Ne/^{22}Ne and ^{21}Ne/^{22}Ne ratios of these fractions range from 9.2 to 10.6, and 0.0391 to 0.197, respectively. The AS (> 2.5 g/cm^3), the heaviest density fraction, shows the highest ^{21}Ne/^{22}Ne ratio (0.197 ± 0.035), indicating the spallogenic Ne was most probably produced from chromite, a major target mineral in the Saratov residue, which is expected to be in this fraction.

References: [1] Lewis R. S. et al. 1975. *Science,* 190:1251-1262. [2] Reynolds J. H. et al. 1978. *Geochim. Cosmochim. Acta,* 42:1775-1797. [3] Ott U. et al. 1981. *Geochim. Cosmochim. Acta,* 45:1751-1788. [4] Wieler R. et al. 1991. *Geochim. Cosmochim. Acta,* 55:1709-1722. [5] Wieler R. et al. 1992. *Geochim. Cosmochim. Acta,* 56:2907-2921. [6] Huss G. R. et al. 1996. *Geochim. Cosmochim. Acta,* 60:3311-3340. [7] Busemann H. et al. 2000. *Meteorit. Planet. Sci.,* 35:949-973. [8] Matsuda J. et al. 2010. *Meteorit. Planet. Sci.,* 45:361-372. [9] Amari S. et al. 2013. *Astrophys. J.,* 778:37 (39pp). [10] Amari S. et al. 2003. *Geochim. Cosmochim. Acta,* 67:4665-4677.