

SEARCHING FOR EVIDENCE OF EXTINCT ^{36}Cl IN EFREMOVKA. T. D. Swindle¹, E. K. Olson, and G. Bart, Lunar and Planetary Laboratory, University of Arizona, Tucson AZ 85721-0092 USA. ¹tswindle@u.arizona.edu.

Since the discovery of the first extinct radionuclide in meteorites, ^{129}I , more than 40 years ago [1], evidence for nearly a dozen other extinct radionuclides has been found. In 1997, Murty et al. [2] reported evidence for ^{36}Cl , in the form of excess ^{36}Ar in samples of matrix from the meteorite Efremovka. The half-life of ^{36}Cl is only 3×10^5 years. But if ^{36}Cl is going to be found in any meteorite, Efremovka is a likely candidate, since that relatively unaltered CV3 is host to evidence of other extinct radionuclides, including ^{41}Ca [3], which has a half-life of only 10^5 years. We set out to determine the initial $^{36}\text{Cl}/^{35}\text{Cl}$ ratio in Efremovka by generating two aliquots, irradiating one with neutrons and analyzing Ar isotopic ratios in both, using identical step-heating patterns, an idea originally suggested by Clayton [4]. Instead, we found that the samples of Efremovka matrix we analyzed showed no evidence of ^{36}Ar excesses. We suspect that this means that the carrier of ^{36}Cl was inhomogeneously distributed within Efremovka.

Several experiments had previously failed to find evidence of ^{36}Cl in various samples from Allende [5-8], but Murty et al. [2] reported strong evidence for its presence in two Efremovka matrix samples. They measured $^{38}\text{Ar}/^{36}\text{Ar}$ ratios 4-5% lower than atmospheric in one temperature step of each sample. Although such a ^{36}Ar could also be caused by neutron capture on stable ^{35}Cl , they also measured Xe, and found that excesses of ^{128}Xe (presumably from ^{127}I) suggested pre-terrestrial neutron fluences far too low to produce the observed effects.

We split and quartered a powdered sample of Efremovka matrix, irradiated one sample in conjunction with an I-Xe experiment on separated components

from Efremovka [9], and analyzed both the irradiated sample and one unirradiated sample. However, we found no evidence for an ^{36}Ar excess in either sample. We analyzed another unirradiated split three years later, and still did not see any evidence of any ^{36}Ar excess. Although Murty et al. [2] found ^{36}Ar excesses of 4-5%, $>20\sigma$, we never found any excesses greater than 0.4% or 1σ (our uncertainties were larger because we used smaller samples and more temperature steps).

We do not believe the discrepancy between our results and those of Murty et al. [2] is the result of an instrumental or experimental artifact, given the size of the effect they observed, and the fact that they observed it on two different instruments. Furthermore, given their experimental procedure, there is no reason to think that the effect they observed was related to pre-terrestrial neutron irradiation. Rather, we suspect that Efremovka contains a ^{36}Cl carrier that is inhomogeneously distributed, and that the sample we had (our three samples all came from a single sample that was homogenized) did not contain any of it.

References: [1] Reynolds J. H. (1960) *Phys. Res. Lett.* 4, 8. [2] Murty S. V. S. et al. (1997) *Astrophys. J.*, 475, L65. [3] Srinivasan G. et al. (1996) *Geochim. Cosmochim. Acta* 60, 1823. [4] Clayton D. D. (1977) *Earth Planet. Sci. Lett.* 36, 381. [5] Hudson B. (1977) *Meteoritics* 12, 258. [6] Jordan J. and Pernika E. (1981) *Meteoritics* 16, 332. [7] G• bel R. et al. (1982) *Geochim. Cosmochim. Acta* 46, 1777. [8] Kirschbaum C. (1986) *Proc. Lunar Planet. Sci. Conf. 17th*, in *J. Geophys. Res.* 91, E129. [9] Swindle T. D. et al. (1998) *Lunar Planet. Sci. Conf. XXIX*, Abstract #1045.