REEXAMINATION OF THE EFFECT OF PYRIDINE TREATMENT ON PHASE Q IN ORGUEIL.

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Introduction: Most of the primordial noble gases in meteorites are trapped in a poorly characterized carbonaceous carrier named "phase Q". Marrocchi et al. [1] reported that the HF/HCl residue of Orgueil (CI) lost the low temperature fractions of heavy noble gases (^{36}Ar, ^{84}Kr and ^{132}Xe) in phase Q upon pyridine treatment. As pyridine is known to induce the swelling of the macromolecular network of organic matter, their result indicates that the low temperature phase Q is macromolecular organic carbon. However, Busemann et al. [2] showed that pyridine had no significant effect on the noble gas contents of HF/HCl residues of Murchison (CM2), Bells (C2 ungrouped), EET 92042 (CR2) and GRO 95577 (CR1).

Thus we prepared the HF/HCl residue of Orgueil and its pyridine-treated sample, and reexamined the results of Marrocchi et al. [1]. We measured the elemental abundances and isotopic compositions of all noble gases by stepwise-heating method with five temperature steps.

Sample Preparation: A 1.2602g aliquot of Orgueil was dissolved with HF/HCl. The obtained original HF/HCl residue was 43.4mg. Eleven percent of the original HF/HCl residue was further treated with fresh pyridine for two days at room temperature. The noble gas measurements were carried out with the mass spectrometer VG5400 installed at Osaka University.

Results and Discussion: Our obtained elemental concentrations of noble gases of the original HF/HCl residue are slightly low compared to those of Marrocchi et al. [1] and Huss et al. [3]. These latter two data sets show very identical ^{36}Ar, ^{84}Kr and ^{132}Xe concentrations and Xe isotopic ratios. The total elemental abundances of noble gases of our pyridine-treated residue were slightly higher than those of Morrocchi et al. [1], but confirmed that pyridine treatment surely decreased the noble gas concentrations in the original HF/HCl residue. The lost fractions of the individual noble gases from the original HF/HCl residue were 21% (^{4}He), 26% (^{22}Ne), 27% (^{36}Ar), 40% (^{84}Kr) and 45%. The lost fractions in Marrocchi et al. [1] are 58% (^{36}Ar), 55% (^{84}Kr) and 61% (^{132}Xe). Thus our lost fractions are lower than those of Marrocchi et al. [1]. Furthermore, lost fractions in our experiment are larger for the heavier noble gas, suggesting that the dissolved noble gases are fractionated more than that in the original HF/HCl residue, which is different from the result by Marrocchi et al. [1] where the decreasing fractions were nearly the same (about 60%) for all heavy noble gases.

The HF/HCl residue of type 1 and 2 carbonaceous chondrites generally yields much hydrocarbon gas at the measurement, especially in low temperature fractions. However, the gas released from the pyridine residue of Orgueil was rather clean compared to that of the original HF/HCl residue in our experiment. Thus it seems that the pyridine does not only induce swelling of the macromolecular network of the organic matter but also destroyed some kind of organic matter.

References: [1] Marrocchi Y. et al. (2005) *EPSL, 236,* 569-578. [2] Busemann H. et al. (2008) *LPS XXXIX,* Abstract #1777. [3] Huss G. R. et al. (1996) *GCA, 60,* 3311-3340.