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ISOTOPIC, CHEMICAL AND TEXTURAL PROPERTIES OF ACID RESIDUES FROM VARIOUS METEORITES

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Detail analysis of acid residues from various meteorites has been continued for study of the evolution of the solar system and information on processes of nucleosynthesis in the pre-solar stage. Last year we reported the results of chemical compositions of acid residues from three meteorites [Canyon Diablo (IA), Allende (CV3), Nuevo Mercurio (H5)] and the preliminary results of Ru isotopic compositions[1]. In these samples, Cr isotopic analyses were also performed to investigate 1) ^{54}Cr(neutron-rich e-process) anomaly and 2) the effect of extinct radioactive nuclide (^{53}Mn→^{53}Cr). The following progress report deals with the chemical and textural properties of acid residues from Murchison(CM2), La Criolla(L6), Qingzhen(E3) and Cr isotopic compositions measured so far.

Major element compositions in acid residues of Murchison, La Criolla, Qingzhen are shown in Table1 along with the fraction of these acid residues. Representative SEM photographs with EDS spectra of the aliquants of acid residues of them are shown in Fig. 1. It is known that spinel, hibonite, chromite etc. as well as carbonaceous matter are present in Murchison residues [e.g. 2], and in our sample, these minerals may be included. But high S content indicates that it contains much S-bearing particles and/or organic matter or something. On the other hand, acid residues of La Criolla consist of chromite for the most part judging from abundant Cr and Fe contents by INAA and Cr:Fe ratios of about 2:1 in the EDS spectra. Ti and V are also much enriched (Ti: 1.51%; 35 times/CI; V: 0.445%; 79 times/CI) in La Criolla residues. In acid residues of Qingzhen, Cr content is relatively low than that of other meteoritic residues. It is consistent with the fact that enstatite chondrite contain no chromite[3]; and Cr:Fe ratios of about 2:1 in the EDS spectra and fairly abundant S content show that daubreelite may be present in Qingzhen residues. In addition, enrichment of refractory siderophiles is characteristics of acid residues for any kind of meteorites. We are now analyzing TEM bright field images and SAD(selected area diffraction) patterns of these acid residues to idetify minerals therein definitely.

The samples (HCl/HF residues) were decomposed in sealed teflon vessels by a microwave dissolution method with several mixed acids and Cr was separated by precipitation and anion exchange method[4]. In mass spectrometric techniques of Cr, the zone-refined (99.995%) outgassed V-shaped Re single filament with silica gel and boric acid was employed. Isotopic analyses were performed by a VG 354 thermal ionization mass spectrometer.

Preliminary Cr isotopic analyses were carried out for acid residues of Allende, Nuevo Mercurio and La Criolla so far. Remarkable isotopic anomalies far beyond experimental errors could not be detected for both ^{53}Cr/^{52}Cr and ^{54}Cr/^{52}Cr, but in acid residues of Allende, ^{54}Cr/^{52}Cr are slightly enriched relative to normal values though errors are rather large. In recent paper, Rotaru et al. [5] suggested that Cr isotopic composition of the Solar System results from the mixing of several major components with distinct isotopic compositions, and that particularly C1 and C2 chondrites keep, at least partially, the memory of their initial isotopic diversity. We expect such heterogenities could be detected in our various kind of samples. Isotope abundance studies in acid residues, concentrating on more specific mineral phases by means of stepwise dissolution method, are currently underway.

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References : [1] Kano, N. et al. (1993) LPS(Abstracts), **24**, 749 [2] Alaerts, D. N. et al. (1980): GCA, **44**,189 [3] Srinivasan, K. et al. (1977): JGR, **48**, 2567. [4] Lee, T. and Tera, F. (1986): GCA, **50**, 199. [5] Rotaru et al. (1992): Nature, **26**, 29-36.

Table 1 Major element contents in acid residues of three meteorites

Sample		Acid residues fraction (wt.%)	combustion method(%) C*	H*	N*	S*	INAA# (%) Cr	Fe	Ni	Al	Mg
Murchison(CM2)	HCl/HF residue	3.12	34.6	2.10	1.48	46.5	1.14	0.694	0.240	0.958	0.943
	HCl/HF-HNO_3 residue	1.30	29.5	1.71	2.56	27.5	1.75	3.50	0.191	1.13	2.15
La Criolla(L6)	HCl/HF residue	0.83	1.20	0.16	---	12.8	35.6	18.8	0.424	2.76	2.75
Qingzhen (E3)	HCl/HF residue	0.65	6.26	2.05	0.71	7.27	0.409	0.800	0.0216	0.673	7.92

*) We are indebted to T. Seki of Tokyo University for determing C,H,N,S.contents of samples.
#) Errors of INAA data are below 5% except Ni in Qingzhen(~10%). Neutron irradiations and use of the counter facilities were carried out at the Inst. for Atom. Energy Res. in Rikkyo University.

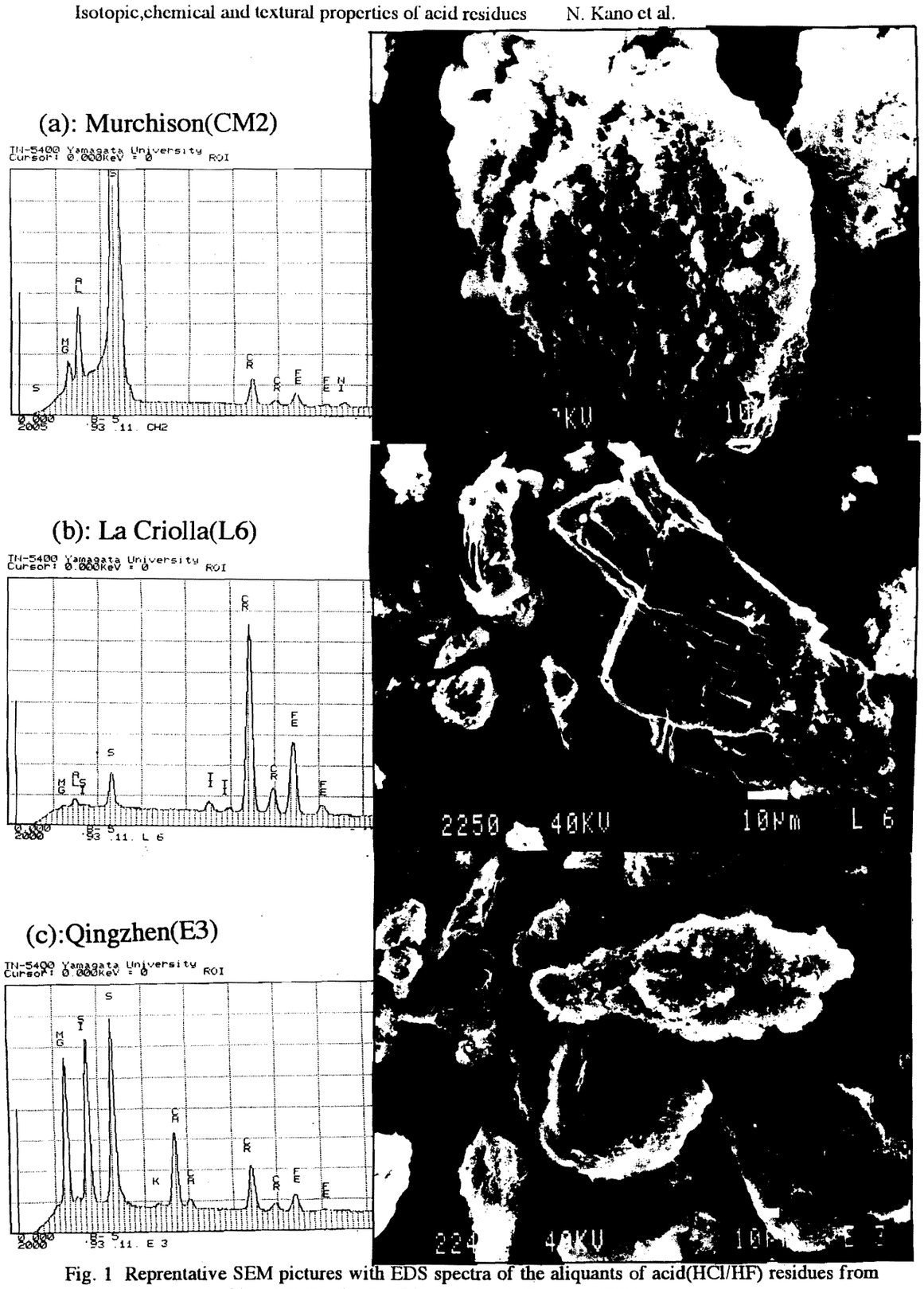

Fig. 1 Reprentative SEM pictures with EDS spectra of the aliquants of acid(HCl/HF) residues from three meteorites((a): Murchison(CM2), (b): La Criolla(L6), (c):Qingzhen(E3)).