ORGANIC COMPONENTS IN CARBONACEOUS CHONDRITE ALH-77307,51 (EXTENDED ABSTRACT)

Tatsushi MURAE, Takeyoshi TAKAHASHI and Akimasa MASUDA

Department of Chemistry, Faculty of Science, University of Tokyo, 3-1, Hongo 7-chome, Bunkyo-ku, Tokyo 113

Examination of the organic components of the carbonaceous chondrites found in Antarctica affords very valuable information on the processes in the solar nebula and the prebiotic chemical evolution of the primordial Earth because of the clean sterile enviroment and minimal terrestrial organic contamination which have been shown by amino acid analyses of Antarctic meteorites ALHA77306 (CRONIN *et al.*, 1979) and ALH-77307 (MOORE *et al.*, 1981).

We have analyzed the C3V Antarctic chondrite ALH-77307,51 (exterior with crust)

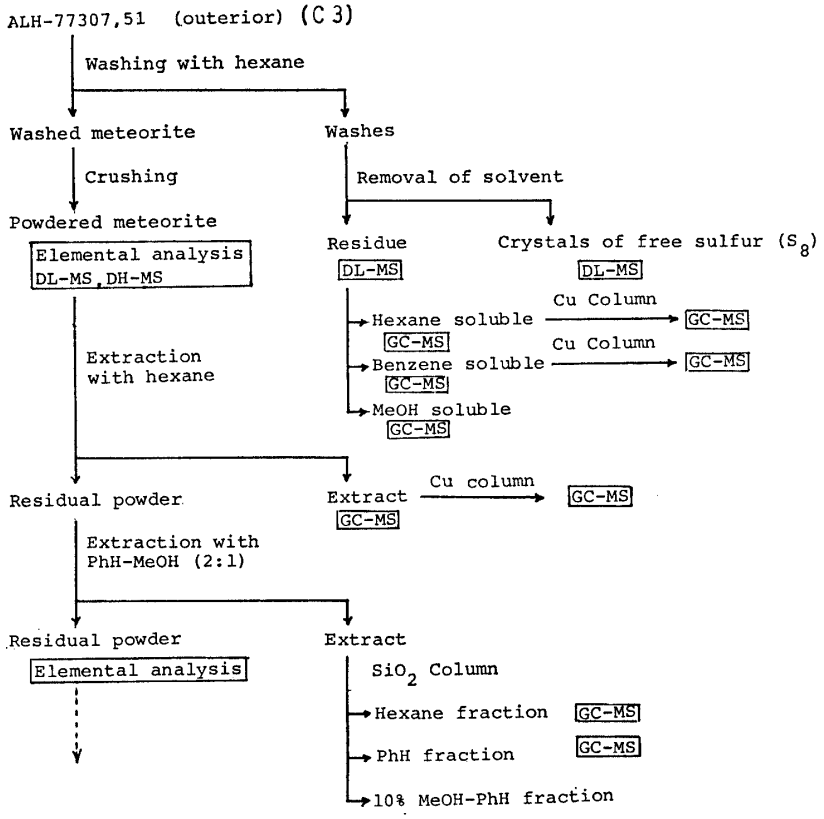

Fig. 1. Scheme of the extraction of ALH-77307 meteorite (outerior with crust) and analyses by low resolution mass spectrometry using direct inlet system (DL-MS), high resolution mass spectrometry using direct inlet system (DH-MS), and low resolution mass spectrometry combined with gas chromatography (GC-MS).

for organic components which can be extracted with organic solvents. The solvent extractions have been carried out principally following the method described by NOONER and ORÓ (1967). The uncrushed whole lump of the meteorite was washed with *n*-hexane and crushed into powder, which was extracted with hexane and then benzene-methanol (2:1). The benzene-methanol extract was chromatographed on a silica gel column to give hexane, benzene, and 10% methanol-benzene fractions. The organic components have been examined at each step as shown in Fig. 1.

On evaporation of the solvent, the hexane washes afforded crystalline elemental sulfur (S_8) which was identified by low resolution mass spectrometry using a direct inlet system. We could obtain only trace amount of elemental sulfur (detected by GC-MS) from the hexane washes of the similar amount of C3 carbonaceous chondrite Allende by the same procedure. Most of the examinations have been done by combination of gas chromatography and mass spectrometry (GC-MS). A packed column (OV-1, 2%, 1 m) was used for GC and the technique of mass chromatography was applied for resolution of the complex chromatograms and for removal of the background.

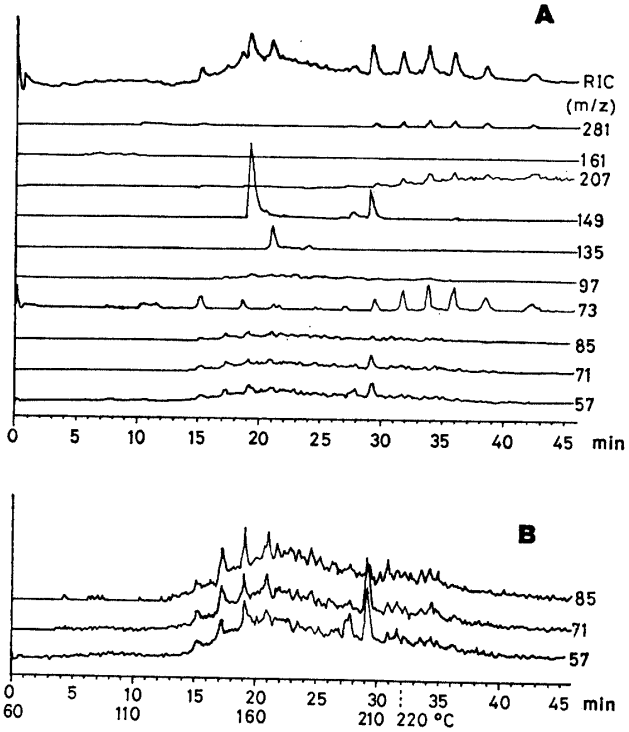

Fig. 2. Mass chromatograms obtained on JEOL JMA 2000 mass data analysis system and JEOL JMS D-300 gas chromatograph-mass spectrometer with a 1 m×3 mm glass column packed with OV-1, 2% on uniport HP 60/80. The column programed at 5°/min from 60° to 220°C. A: Mass chromatograms of n-hexane extract (sulfur free). RIC (reconstructed ion chromatogram) and mass chromatograms in relative intensity for n-alkanes (m/z 57, 71, 85), esters of phthalic acids (m/z 149), the back ground from the GC column (m/z 73, 207, 281), and other ions (m/z 97, 135, 161). B: The same mass chromatograms as A for the ions at m/z 57, 71, and 85 in raw intensity.

In addition to the total ion monitor chromatogram, the mass chromatograms of the ions at *m/z* 57, 71, and 85 were examined for normal alkanes, the ions at *m/z* 57, 70, 99, and 114 for branched alkanes, the ions at *m/z* 91, 106, and 119 for alkyl benzene and the ions at *m/z* 74 and 87 for methyl esters of fatty acids. The mass chromatogram of the ion at *m/z* 149 was also examined in order to check the pollution by esters of phthalic acids. Figure 2 shows a part of mass chromatogram of the hexane extract from which elemental sulfur was removed by passing through a column of activated copper (BLUMER, 1957). The peaks in the chromatograms of the ions at *m/z* 73, 207, and 281 were attributable to the backgrounds from the liquid phase of the GC column. Figure 1B shows the chromatograms of the ions at *m/z* 57, 71, and 85 in an enhanced manner and they suggest the presence of normal alkanes whose amounts are much smaller than those reported for other carbonaceous chondrites (STUDIER *et al.*, 1972; ORÓ *et al.*, 1971; GELPI and ORÓ, 1970, and references cited therein). Figure 3 shows the mass chromatograms of the sulfur free hexane fraction obtained after the silica gel column chromatography of the benzene-methanol extract. No remarkable peak of *n*-alkane could be observed. The RIC chromatograms in Fig. 2 and Fig. 3 suggest the presence of complex mixture of organic compounds. The chromatograms of the ion at *m/z* 135 in Fig. 2 and of the ion at *m/z* 161 in Fig. 3 show the possibility of identification of

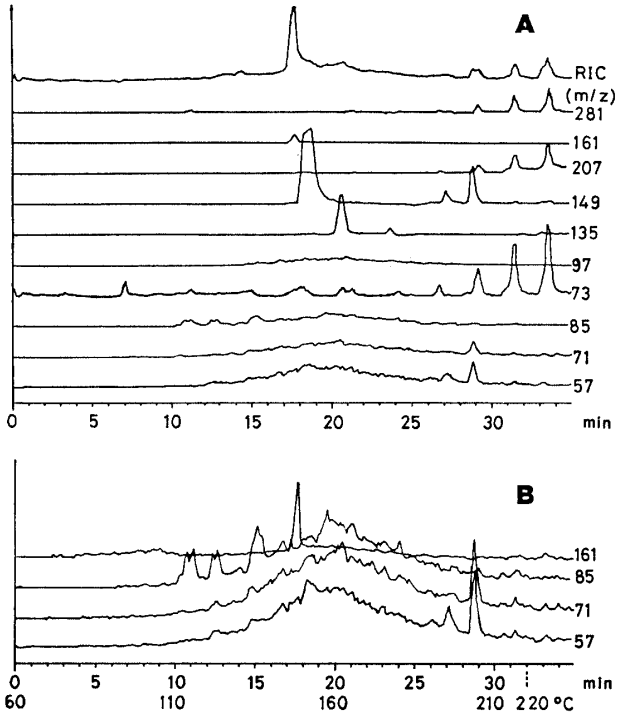

Fig. 3. Mass chromatograms of the n-hexane fraction of the benzene-methanol extract. Conditions are the same as Fig. 1. A: RIC and mass chromatograms in relative intensity for n-alkanes (m/z 57, 71, 85) esters of phthalic acids (m/z 149), background from the GC column (m/z 73, 207, 281), and other ions (m/z 97, 135, 161). B: The same mass chromatograms as A for the ions at m/z 57, 71, 85, and 161 in raw intensity.

some compounds. Therefore, examinations of the mass chromatograms for all of the ions detected are under way. Elemental analyses for the carbon suggested that almost all of the carbon remains in the meteorite after the extraction procedure (0.75% of carbon was found before and after extraction). Application of the vaporization-pyrolysis method (LEVY *et al.*, 1973) and high resolution gass chromatography for the analysis of the nonextractable organic components in the meteorite is in progress.

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