H, C and N isotopic compositions of NaCl bearing organic sample in Hayabusa category 3.

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We have reported H, C and N isotopic compositions of Hayabusa category 3 samples, RB-QD04-0047-02, RA-QD02-0120, and RB-QD04-0001 [1]. All samples show terrestrial H, C, and N isotopic compositions within errors, and none of these samples contain μm-sized hot spots with anomalous H, C, and N isotopic compositions, unlike previous isotope studies for extraterrestrial organic materials of IOM [2], nano-globules in chondrites [3], IDPs [4], and STARDUST cometary dusts [5, 6]. It is difficult to conclude, based on the isotope data, whether these Hayabusa category 3 samples are terrestrial contaminants or extraterrestrial materials. We have, thus, continued investigations of category 3 samples through a developed sequential analyses including ToF-SIMS, NanoSIMS, (S)TEM, FT-IR, Raman spectroscopy and XANES that described in [7].

In this study, new category 3 samples of RB-QD04-0037-01 and RA-QD02-0180 were available for isotopic measurements with a NanoSIMS ion microprobe. Both samples were mainly composed of C, N and O based on FE-SEM with EDS analysis at JAXA/ESCuC [8]. It is noted that RA-QD02-0180 contains trace amount of Na, K and Cl [7].

These samples show homogeneous and terrestrial H, C and N isotopic composition (δD = -8 ~ +2 ‰, δ^{13}C = -8 ~ 0 ‰ and δ^{15}N = +5 ~ +25 ‰ for RB-QD04-0037-01; δD = +1 ~ +13 ‰, δ^{13}C = -21 ~ -29 ‰ and δ^{15}N = +13 ~ +14 ‰ for RA-QD02-0180). In RA-QD02-0180, we found numerous O, S and Cl enriched μm-sized regions that scatterd among the sample. Locations of O, S and Cl areas were different so these element distributions were not related each other. We readily determined C and N isotopic ratios of each of the ^{16}O, ^{32}S and ^{35}Cl areas in the field of view by defining regions of interest. Based on isotope images of δD, δ^{13}C and δ^{15}N, there were no obvious isotopic anomalies from any of ^{16}O, ^{32}S and ^{35}Cl areas in the sample. Bridge et al. [9] reported that halite assemblage was found in the Nakhla Martian meteorite implying a low-temperature formation process by crystallisation from an aqueous fluid. It is important to explore the nature and origin of the NaCl bearing sample for understanding of water-mineral interaction and relationship with organics. We, therefore, continue to investigate RA-QD02-0180 sample by coordinated analysis with NanoSIMS, TEM, FIB, C-XANES, Raman spectrometry and FT-IR.

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