

Search for Extra-Solar Materials as Carriers of Anomalous Noble Gas Isotopes in Meteorites

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1988 Fiscal Year Final Research Report Summary

Search for Extra-Solar Materials as Carriers of Anomalous Noble Gas Isotopes in Meteorites

Research Project

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60430012

Research Category

Grant-in-Aid for General Scientific Research (A)

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Single-year Grants

Research Field

無機・錯塩・放射化学

Research Institution

KANAZAWA UNIVERSITY

Principal Investigator

SAKAMOTO Koh Kanazawa University, Faculty of Science, Professor, 理学部, 教授 (10013377)

Co-Investigator(Kenkyū-buntansha)

HAMAJIMA Yasunori Kanazawa University, Faculty of Science, Research Associate, 理学部, 助手 (60172970)

KOMURA Kazuhisa Kanazawa University, Faculty of Science, Assistant Professor, 理学部, 助教授 (00110601)

NAKANISHI Takashi Kanazawa University, Faculty of Science, Assistant Professor, 理学部, 助教授 (00019499)

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Nucleosynthetic origin / Noble gas isotopes / Photospallation / Photopion reaction / Mass spectrometer / Allende / Murchison / 核理論

Research Abstract

1. Nucleosynthetic origin of meteoritic noble gas isotopes of anomalous isotopic compositions were further examined in light of a stellar model prediction by Heymann et al. Our three-isotope analysis has revealed the s- and r-process isotopes more distinctively than previous ones, and shown that the nucleosynthetic model is very promising in explanation of the observed anomalies in the noble gas abundance. Stellar condition for photodisintegration was found to be the same as deduced earlier by us, i.e. the duration of the silicon burning at peak temperature of $T_9=2.05$ is $(6.5 \pm 0.5) \times 10^4$ sec to yield $(^{124}\text{Xe} / ^{126}\text{Xe})_p=2.1 \pm 0.2$ and the observed heavy Xe ratios to constrain the condition of the explosive phase to have a neutron dose of $3.8 \times$

10^{-7} [mole/cm³.sec] yielding (¹³⁴Xe/¹³⁶Xe)_r=0.675. The carrier phase(s) for s- and r-(& p-) isotopes have recently been assigned to very minute SiC and diamond, respectively, but still under debate (see 3. below).

2. Energetic photons, together with high flux of neutrons, seem to be responsible for reprocessing of chemical elements at supernova explosion. To explore this possibility, photospallation, photofragmentation, photofission and photopion reaction were studied systematically for 13 target nuclei ranging from ¹²C to ²⁰⁹Bi at bremsstrahlung end point energies of 30-1000 MeV. New characteristic features of their yields and excitation functions were found and examined in light of nuclear theory.

3. A sophisticated mass spectrometer of high sensitivity has been constructed and under operation for noble gas isotope study. Meteorite samples were the Allende and Murchison, 10-20 g pieces of which were separately disaggregated by freeze-thaw method and separated into 70 fractions, in case of a 20 g Allende, based on size and density. These fractions were then analyzed for major and trace elements and mineral compositions and for their characteristic features of occurrence. Some new types of mineral occurrences found in the present work, together with further analysis of noble gas isotopes in the separated fractions, are expected to give observational clues to the origin and formation history of the chemical elements in the solar system.▲ Less

Research Products (13 results)

All Other

All Publications (13 results)

[Publications] 藤原一郎,坂本浩 他: 原子核研究. 33(2). 187-201 (1988) ▼

[Publications] K.Sakamoto, et.al.: University of Tokyo,INS,Annual Report 1988 印刷中. (1989) ▼

[Publications] K.Sakamoto, et.al.: Institute for Nuclear Study,Univ.of Tokyo,INS-Rep.-713. 1-31 (1988) ▼

[Publications] K.Sakamoto: Geochemical Jour.,. 23(1). (1989) ▼

[Publications] K.Sakamoto, et.al.: Nucl.Phys.A. (1989) ▼

[Publications] K.Sakamoto, et al.: Nucl.Phys.A. (1989) ▼

[Publications] K. Sakamoto; et al.: "Present status of radiochemical studies of (γ , α^+), (γ , α^-) reactions, photospallation and photofragmentation." Genshikaku Kenkyu. 33 (2). 187-201 (1988) ▼

[Publications] K. Sakamoto; et al.: "Chromium and titanium isotopes produced in photonuclear reactions of vanadium, revisited." Rep. of Institute for Nuclear Study, University of Tokyo. INS-Rep.-713. 1-31 (1988) ▼

[Publications] K. Sakamoto; et al.: "Intranuclear cascade-evaporation calculations for photopion reactions of ⁵¹V and ¹³³Cs." Annual Report 1988, Institute for Nuclear Study, University of Tokyo. 1988. (1989) ▼

[Publications] T. Fukasawa; et al.: "Photonuclear reactions of ¹⁹⁷Au--photopion, photospallation and photofission yield measurements." Annual Report 1988, Institute for Nuclear Study, University of Tokyo. 1988. (1989) ▼

[Publications] K. Sakamoto; et al.: "Xenon and barium isotope yields in photopion reactions in cesium-133" Phys. Rev. C., (1989) ▼

[Publications] K. Sakamoto: "Nucleo synthetic origin of anomalous xenon and krypton : isotopery and elementology." Geochem. Jour., to be accepted under revision.23 (1). (1989) ▼

[Publications] K. Sakamoto: "Chromium and titanium isotopes produced in photonuclear reactions of vanadium, revisited." Nucl. Phys. A., (1989) ▼

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