中高エネルギ-光核反応の放射化学的研究

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1990 Fiscal Year Final Research Report Summary

Radiochemical Study on Photonuclear Reactions at Intermediate Energies

Research Project

Project/Area Number

01470049

Research Category

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

Allocation Type

Single-year Grants

Research Field

無機・錯塩・放射化学

Research Institution

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Keywords

Intermediate Energy / Photopion / Photospallation / Photofragmentation / PICA / Rudstam formula / ^7Li-^<209>Bi / Cross Sections

Research Abstract

A systematic radiochemical study on bremsstrahlung-induced photopion, photospallation and photofragmentation was performed on targets ranging from ^7Li to ^<207>Bi at end-point energies (E_0) from 40 to 1000 MeV in steps of 100 MeV or less.
(1) The yields of ^7Be, ^<11>C, ^<27>Mg, ^<41>Ar, ^<59>Fe, ^<87>Kr, ^<88>Rb, ^<103>Ru, ^<133>Xe, ^<139>Ba and ^<181>Hf from (gamma, pi^<<plus-minus>>) reaction and of ^<59-x>Ni(x=2,3), ^<127-x>Xe(x=0-6), ^<133-x>Ba(x=0-9), ^<139-x>Ce (x=0-8) from (gamma, pi ^-xn reactions were obtained from ^7Li, ^<11>B, ^<27>Al, ^<41>K, ^<59>Co, ^<87>Rb, ^<88>Sr, ^<103>Rh, ^<127>I, ^<133>Cs, ^<139>La and ^<181>Ta. Unfolding into cross sections per photon of monochromatic energy k was performed on the measured yields after correction for secondary

reactions. Excitation curves were characteristic of (3,3) resonance, and their systematic features with respect of k (and E_0), A_t and x were derived and discussed with references of total photoabsorption cross sections an d also of PICA (photon-induced cascade analysis) calculations. Results were consistent with our previous findings from ^<51>V (gamma, pi^+) ^<51>Ti, ^<51>V (gamma, pi^-xn) ^<51-x>Cr (x=0,2,3), ^<89>Y (gamma, pi^-xn) ^<89-x>Zr (x=0-3), ^<197>Au (gamma, pi^-xn) ^<197-x>Hg (x=0-7) and ^<209>Bi (gamma, pi^-xn) ^<209-x>Po (x=2-7).
(2) The measured yields of 21 to 47 products ranging in 5-10 elements each from the targets of ^<51>V, ^<59>Co, ^<89>Y, ^<127>I, ^<133>Cs, ^<139>La, ^<176>Lu, ^<197>Au and ^<209>Bi were measured as a function of E_0 from thresholds to 1000 MeV. After correction for precursor-decays, isotopic, isobaric and charge distributions and their E_0 and A_t dependences were investigated and a new empirical expression for the product formations were proposed with reference to Rudstam formula for hadron spallation. PICA calculations for bremsstrahlung spallation were performed and found not to reproduce the observed yields especially for medium to heavy targets.
(3) While the ^<22.24>Na yields from ^<35.37>Cl, ^<63.67>Cu and ^<89>Y were explained by spallation, photofragmentaion was evidenced with high but mass dependent yields of ^<7.10>Be from these targets.▲ Less

Research Products (6 results)

All Other

All Publications (6 results)

[Publications] SAKAMOTO,Kah,et al.: "Barium and Xenon Isotope Yields in Photopion Reactions of 133_<Cs>" Phys.Rev.C. 42(4). 1545-1558 (1990)

[Publications] SARKAR,S.R.,et al.: "Photospallation of Complex Nuclei at Intermediate Energies—I" Radiochim.Acta. (1991)

[Publications] SARKAR,S.R.,et al.: "Photospallation of Complex Nuclei at Intermediate Energies—II" Radiochim.Acta. (1991)

[Publications] K. Sakamoto, Y. Hamajima, M. Soto, Y. Kubota, M. Yoshida, A. Kunugise, M. Masatani, S. Shibata, M. Imamura and I. Fujiwata :"Barium and Xenon Isotope Yields in Photopion Reactions of ^<133>Cs." Phys. Rev. C.42(2),. 1545-1558 (1990)

[Publications] S. R. Sarkar, M. Soto, Y. Kubota, M. Yoshida, T. Fusasawa, K. Matusmoto, K. Kawaguchi, K. Sakamoto, S. Shibata, M. Furukawa and I. Fujiwara :"Photospallation of Complex Nuclei at Intermediate Energies-I." Radiochim. Acta.(1991)

[Publications] S. R. Sarkar, Y. Kubota, T. Fukasawa, K. Kawaguchi, K. Sakamoto, S. Shibata and I. Fujiwara :"Photospallation of Complex Nuclei at Intermediate Energies-II." Radiochim. Acta,. (1991)

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