

Nuclear Science and Transmutation Research Division

Nuclear Transmutation Data Research Group

Fast RI Data Team

1. Abstract

Fast RI team aims at obtaining and accumulating the cross section data for long lived fission products (LLFPs) in order to explore the possibility of using accelerator for nuclear transmutation.

LLFPs as nuclear waste have been generated continuously in nuclear power plants for wealth for human lives, while people noticed the way of disposal has not necessarily been established, especially after the Fukushima Daiichi power plant disaster. One of the ways to reduce the amount of LLFP or to recover them as recycled resources is nuclear transmutation technique.

RIBF facility has a property to generate such LLFP as a secondary beam and the beam species are identified by event by event. Utilizing the property, absolute values of the cross section of various reactions on LLFPs are measured and accumulated as a database.

2. Major Research Subjects

- (1) Measurement of reaction products by the interaction of LLFPs with proton, deuteron, and photon to explore candidate reactions for the transmutation of LLFPs.
- (2) Evaluation of the cross section data for the neutron induced reactions from the obtained data.

3. Summary of Research Activity

- (1) Acting as a collaboration hub on many groups which plan to take data using fast RI beams in RIBF facility.
- (2) Concentrating on taking data for proton and deuteron induced spallation reactions with inverse kinematics.
- (3) Accumulating the cross section data and evaluating them as evaluated nuclear data.
- (4) Evaluating cross section of neutron induced reaction on LLFP by collaborating with the nuclear model calculation and evaluation group.

Members

Team Leader

Hideaki OTSU (Concurrent: Team Leader, SAMURAI Team)

Visiting Scientist

Takashi TERANISHI (Kyushu Univ.)

Student Trainee

Koichi GOTO (Kyushu Univ.)

List of Publications & Presentations

Publications

[Original Papers]

X. H. Sun, H. Wang, H. Otsu, H. Sakurai, *et al.*, "Spallation and fragmentation cross sections for 168 MeV/nucleon ^{136}Xe ions on proton, deuteron, and carbon targets," *Phys. Rev. C* **101**, 064623 (2020).

[Proceedings]

H. Wang, H. Otsu, H. Sakurai, *et al.*, "Spallation reaction study for long-lived fission products in nuclear waste," *EPJ Web Conf.* **239**, 06003 (2020) (Proc. International Conference on Nuclear Data for Science and Technology (ND2019), Beijing, China, May 19–24, 2019).

K. Nakano, Y. Watanabe, S. Kawase, *et al.*, "Isotope-production cross sections of residual nuclei in proton- and deuteron-induced reactions on ^{93}Zr at 50 MeV/nucleon," *EPJ Web Conf.* **239**, 20006 (2020) (Proc. International Conference on Nuclear Data for Science and Technology (ND2019), Beijing, China, May 19–24, 2019).

X. Sun, H. Wang, H. Otsu, H. Sakurai, *et al.*, "Cross-section measurement in the reactions of ^{136}Xe on proton, deuteron and carbon" *EPJ Web Conf.* **239**, 01037 (2020) (Proc. International Conference on Nuclear Data for Science and Technology (ND2019), Beijing, China, May 19–24, 2019).

Presentations

[International Conferences/Workshops]

R. Matsumura, H. Otsu, H. Wang, N. Chiga, *et al.*, "Nuclear transmutation of high-radiotoxic nuclide ^{90}Sr via proton- and deuteron-induced reactions in inverse kinematics," A3F-CNS Summer School 2020, online, August 17–21, 2020.

[Domestic Conferences/Workshops]

松村理久, 大津秀暁, 王赫, 千賀信幸, 他 ImPACT-RIBF Collaboration, 「核分裂生成核種 ^{90}Sr の陽子及び重陽子誘起反応に関する研究」, 日本物理学会第 75 回年次大会, 愛知県名古屋市 (名古屋大学現地開催中止), 2020 年 3 月 16–19 日.

松村理久, 大津秀暁, 王赫, 千賀信幸, 他 ImPACT-RIBF Collaboration, 「高放射性核種 ^{90}Sr の陽子及び重陽子誘起反応による核変換に向けた研究」, Symposium on Nuclear Data 2020, 埼玉県和光市, 2020 年 11 月 26–27 日.