Summary of my research activities

M. Katsuma

Nuclear reactions

Nuclear reaction theory Low-energy nuclear reaction relevant to astrophysics [2-5][10]

- Theoretical $^{12}C(\alpha,\gamma)^{16}O$ reaction rates are calculated.

Nuclear rainbow phenomena [7,8,19,24]

- Investigated the phenomenological potential for the $\alpha+^{12}C$ system
- Scrutinized the nuclear interaction potential between ^{16}O-^{16}O nuclei.
- Investigated molecular resonance for the $^{16}O+^{16}O$ system at low energies, in the consistent description with the nuclear rainbow.

Cluster structure, and Molecular resonances [1,11,12,20-22]

- Predicted the 8^+ and 9^- resonant states in the rotational bands of ^{16}O.
- Tried to describe the molecular resonance for the $^{16}O+^{16}O$ system, with microscopic coupled-channel method.

Spin polarization [9]

- Examined the possibility of the spin-orbit part of the microscopic folding model for ^{3}He, and predicted the experimental results for spin-polarization.

Nuclear data

Reaction rates for astrophysics: NACRE (Brussels) [13-16]

- Worked for an update and extension project of nuclear reaction rate library (NACRE), was in charge of the development of a code package evaluating low-energy nuclear reactions relevant to nuclear astrophysics.
- Proposed the re-consideration of the contribution from the direct mechanism using the direct capture potential model and distorted wave Born approximation (DWBA).

Charged particle nuclear reactions: NRDF, EXFOR (Hokkaido Univ.) [6,17,18,23]

- Developed a web application of a calculator of elastic scattering cross section.
- Tried to establish an evaluation method for mass fragmentation of the high-energy proton induced reactions in the development of the accelerator driven nuclear reactors.
- Engaged in the assistance of the construction and design of nuclear reactors with accelerator-driven transmutation system for the next generation.