Research plan

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In the future, I am planning to investigate extensively the direct mechanism in light heavy and light-ions induced reactions relevant to nuclear astrophysics. This research project includes three categories: interaction potentials, spectroscopic factors, and reaction dynamics.

- Optical potentials describing p, d, t, ^{3}He, α and ^{6,7}Li elastic scattering on up to Mg targets
- Re-evaluation of the spectroscopic factors and asymptotic normalization constants
- Coupled-channel (CC) effect in comparison of the results between DWBA and CC

To move forward, the comprehensive investigation of these three should be performed mutually. The coupling effects may play an important role in the evaluation of the reactions, because it is generally expected to make the large correction to the one-step transition at low energies. The spectroscopic information of the ground and excited states may be re-evaluated. Preceding both the studies, the investigation of the optical potential is essential, for example, the energy dependence of the correct strength of potentials. The deduced low-energy extrapolation of the optical potential predicts molecular resonance and cluster structure of the excited states in nuclei, and seems to give some clue of the estimated cross section and its derived reaction rates for astrophysics.

In the near future, I am going to analyze the low-energy ^{13}C(α,n)^{16}O reaction, which is still frontier, and predict the theoretical reaction rates. The α+n+^{12}C three-body structure is assumed in the reaction models. I will compare the different type of the models.

The nuclear data compilation is expected to be applied widely to the development of atomic power and medical care. I might want to contribute some as an evaluator of nuclear reaction data in collaboration with relevant institutions.