

Measurements of Neutron Capture Cross Sections for $^{237, 238}\text{Np}$

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Recent progress on the measurement of neutron capture cross sections performed by a JNC and Kyoto university group is reviewed focusing on ^{237}Np and ^{238}Np . The neutron capture cross section of ^{237}Np is extremely important in the field of innovative nuclear cycle research including the study of nuclear transmutation and the high burn-up study of nuclear fuel. The neutron capture cross section of ^{238}Np is also important to study the burn-up of ^{237}Np by an intense neutron flux.

Firstly, an experimental issue on the measurement of thermal-neutron capture cross sections and resonance integrals is discussed. Since there are some resonances near 0.5 eV (that is, typical Cd cut-off energy) in Minor Actinides (MAs), special attention has to be paid for the experiment and analysis. To overcome this problem, some techniques have been utilized recently. The case of ^{237}Np ¹⁾ will be discussed on this matter and future tasks will be presented.

In second, the effectiveness of utilizing a double-neutron capture reaction for the measurement of the neutron capture cross section for short-lived nuclei is discussed using the example of the recent successful result²⁾ on ^{238}Np , whose half-life is only 2.1 days. The experimental key points in this measurement including an issue of sample analysis are discussed as well as an issue of the measurement of weak radioactivity in strong background.

In third, the measurements of the energy dependence of the neutron capture cross section of ^{237}Np are reviewed focusing on the experimental progress, including a total-energy detector³⁾ and a flash-ADC based data-taking system³⁾. The experimental results will be compared each other and also with some nuclear data libraries. Future issues and possibilities will be also discussed.

References

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