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Indirect studies on astrophysical reactions at the low-energy RI beam separator CRIB

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CRIB (CNS Radioisotope Beam Separator) is a low-energy RI beam separator operated by CNS, University of Tokyo, located at RIBF of RIKEN Nishina Center. Various experimental projects based on interests for nuclear astrophysics have been carried out at CRIB, forming international collaborations. We present recent activities on nuclear astrophysics at CRIB.

We have studied proton/alpha resonant scatterings on many systems [1,2], using thick target method in inverse kinematics. We observed nuclear resonances which may contribute to astrophysical reaction rates. As for the 7Be+a resonant scattering [2], we evaluated 7Be(a,g) resonant reaction rate with the higher-lying resonance information obtained with the measurement. The latest resonant scattering measurement was the proton resonant scattering on an isomer-enriched 26Al RI beam.

Indirect measurements of relevant astrophysical reactions have also been performed at CRIB. The world's first application of the Trojan horse method for an RI beam was to determine the astrophysical 18F(p,alpha) reaction rate. We measured quasi-free 18F(d,alpha n) reaction and determined the low-temperature 18F(p,alpha) reaction S-factor for the first time [3]. Another measurement was performed recently to determine 7Be(n,p) and (n,a) reaction rates, which can be relevant for the cosmological 7Li abundance problem.

References

[1] J.J. He et al., Phys. Rev. C 88, (2013) 012801(R).

[2] H. Yamaguchi et al., Phys. Rev. C 87 (2013) 034306.

[3] S. Cherubini et al., Phys. Rev. C 92 (2015) 015805.

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