Precision mass measurements of neutron-rich nuclei for the r-process

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Nuclear masses, giving a direct access to nuclear binding energies, are one of the most sensitive nuclear physics inputs for the calculations of the astrophysical rapid neutron capture process (r-process) nucleosynthesis [1]. In this talk, we report on recent precision mass measurements of neutron-rich nuclei performed at the JYFLTRAP double Penning trap mass spectrometer at the IGISOL facility in the JYFL Accelerator Laboratory. Together with the standard Time-of-Flight Ion Cyclotron Resonance (TOF-ICR) technique, the Phase-Imaging Ion-Cyclotron-Resonance (PI-ICR) technique is now routinely used at JYFLTRAP [2]. The recent mass measurements have focused on three regions. Firstly, the mass measurements of neutron-rich isotopes of Nd, Pm, Sm, Eu, Gd and Tb have reduced the uncertainties related to the r-process calculations for the rare-earth abundance peak [3]. Secondly, the masses of neutron-rich Ag, I and In isotopes have been measured. These nuclei lie close to doubly magic ^{132}Sn region, which has been shown to have the highest impact on the calculated r-process abundances [1]. Thirdly, we have measured masses of neutron-rich Fe, Co, Ni, Cu and Zn isotopes in the vicinity of ^{78}Ni, which are relevant for the study of core-collapse supernovae. Our measurements significantly reduce the uncertainties of the studied masses, some of which were measured for the first time.

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