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ISOLTRAP masses for nuclear structure and the r process

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Precision Penning-trap mass measurements carried out in the heavy-mass region are very suitable to investigate mainly topics related to the rapid-neutron-capture process and nuclear structure. Higher-order nucleon interactions caused by small changes in the binding energy, which are expected to be small compared to the total mass, yet very localized. In conjunction with the mass measurements on Xe and Rn, the masses of the Fr isotopic chain provide accurate mass values over the entire region of the prediction of the octupole component from the finite-range drop model and help to investigate the conditions associated with octupole shapes.

The heavy-mass region is also of interest due to the process of fission that can allow the r-process to recycle. Mass measurements are important as input data for modeling and for adjusting the parameters of different mass models. The r process can take different paths corresponding to astrophysical conditions that respect the waiting-point validity approximation. Now, the adjacent isotope chains of Fr produced five new masses which can be used to add beta-decay energies which are important for the evaluation of beta-decay half-lives that greatly influence the r-process. In addition, the successful determination of the mass as well as the half-life of 82Zn with ISOLTRAP is valuable input for the r-process waiting point 80Zn.

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