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Determination of electronic stopping powers of 0.05-1 MeV/u 131Xe-ions in C-, Ni- and Au-absorbers with calorimetric low temperature detectors

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Precise data on electronic stopping powers for heavy ions are of high interest in various fields of research. Since more than one decade a new technique, which uses a combination of time-of-flight and energy detectors to collect continuous dE/dx data over a wide range of energies in a single measurement [1], has been successfully applied in different experiments. However, for high ion masses and low energies, where dE/dx data are nowadays still scarce, ionization based energy detectors suffer from incomplete energy detection, resulting in pulse height defect and a relatively poor energy resolution. As calorimetric low temperature detectors (CLTD's) provide substantially better energy resolution and linearity (with the absence of any pulse height defect) for heavy ion detection [2], this type of energy detectors has the potential to increase sensitivity and accuracy for dE/dx measurements and to extend the accessible energy range towards lower energies. For that purpose a CLTD array has been used to replace the Si-detector in an established setup for dE/dx measurements at the K-130 cyclotron at the University of Jyväskylä, and to perform measurements with 0.05–1 MeV/u 131Xe-ions in carbon, nickel and gold absorbers [3]. In addition to the determination of new stopping power data for low energy heavy ions, the excellent energy resolution of CLTD's allowed to resolve unexpectedly strong channeling effects for thin polycrystalline absorbers in the transmission type energy loss measurement, and therefore also to obtain data for channeling energy loss of 0.1–0.5 MeV/u 131Xe ions in nickel and gold absorbers. This contribution will present the detector concept of CLTD's as well as the results of this recent application for stopping power measurements.

References
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