Magnetic Microcalorimeters (MMCs) are cryogenic detectors consisting of an absorber, a paramagnetic sensor, and superconducting pick-up coils. MMCs can be used to detect radiation with high energy resolution. MMCs have been previously employed as gamma-ray sensors and have demonstrated resolution that is far superior to traditional HPGe detectors. We are developing MMC-based decay energy spectrometry (DES) techniques for high-accuracy measurements of the absolute activity and isotopic composition of radioactive samples. Samples are fully embedded within a gold foil absorber in thermal contact with the MMC device. Decay radiation in the form of alphas, conversion electrons, betas, nuclear recoils, and low-energy photons is absorbed and thermalized within this foil with near 100% efficiency, producing spectra with single peak(s) at the total decay energy of each nuclide. The total number of decays and the absolute activity can be obtained by integrating the decay energy peaks. Using this technique, we measured the absolute activities of 146Sm and 147Sm samples with known masses to improve the accuracy of their half-life values. The systematics of the measurements have been rigorously studied and examined. The broader applicability of the experimental technique has been demonstrated via measurements of various mixed actinide samples as well as a precision measurement of the Pu-241 beta end-point.