A simple non-destructive approach for the determination of ^{40}K by gamma spectroscopy

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The determination of the potassium radioisotope ^{40}K is required in several chronological methods such as K-Ar dating, electron spin resonance (ESR) and optically stimulated luminescence (OSL). Traditionally, the determination of ^{40}K is carried out by flame photometry or atomic absorption spectroscopy (ASS) for K-Ar, and *in situ* dosimeters for ESR and OSL. The availability of new-generation high-efficiency and low-background Gamma well detectors might offer an alternative method, non-destructive, to determine precisely ^{40}K. In order to explore such a possibility, five certified Geostandards (feldspar, trachyte, biotite, glass and glauconite) from CRPG Nancy, France were used to calibrate the energy and efficiency of the Gamma well detector at GEOTOP, Montreal. Following the calibration, aliquots of 20 samples that have been previously analyzed for their K content by AAS in the K-Ar laboratory of the University of Paris-Sud were analyzed for the activity of ^{40}K by gamma spectroscopy. The results show a good agreement between the two methods in both their accuracy and precision. The major advantage of the Gamma Spectroscopy is the non-destructive nature of the analysis; the same sample aliquot can be used to perform ^{40}Ar measurement and therefore avoid uncertainties related to sample heterogeneity in K-Ar dating. Another key advantage is the rapidity of the measurements; depending on the K_2O content of the samples, counting time lasts only a few hours, avoiding long and tedious chemical treatment.