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Development of a fast method for quartz purity control by luminescence for cosmogenic nuclide dating

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Applications of *in situ* produced ^{10}Be and ^{26}Al for age determination use quartz containing lithologies, because these nuclides are produced from Si and O in quartz at a defined rate. To be able to calculate reliable ages, it is critical to extract CRN from quartz grains only. Ubiquitous and problematic contaminants are minerals from the feldspar group for three reasons: 1) ^{10}Be and ^{26}Al can also be produced from Si and O in feldspar but at a different production rate 2) feldspar contains copious amounts of Al and can thus contribute stable ^{27}Al in high amounts 3) Feldspars are omnipresent and often intergrown with quartz. As a consequence the presence of a few percent feldspar leads to problems during sample processing and during Accelerator Mass Spectrometry measurement where the rare nuclide ^{26}Al may reach its detection limit.

Today several methods are used to check the mineralogical composition and the quality of a purified quartz sample. 1) Optical investigation using a binocular microscope, 2) X-ray diffraction (XRD) analysis of the mineralogical composition 3) element analysis after digestion of a sample aliquot to determine the Al content because Al is part of the feldspar lattice 4) SEM analysis of samples. However, each of those methods are limited by their resolution, detection limit, preparation- and waiting time, as well as costs.

Here we report first results of exploring the potential of luminescence as a very fast (measurement time of a few minutes) and cost-efficient alternative method to determine the content of feldspars in quartz using infrared stimulation that only excites feldspars, but not quartz. Natural samples with different feldspar concentrations are used to explore the resolution of the method. Luminescence results are compared to results from XRD to define the bulk mineralogy, element analysis by ICP-OES analysis for main elements, and SEM on selected samples. The idea for this study was to develop a fast, efficient luminescence measurement sequence capable to reliably detect feldspar in purified quartz samples to be able to decide whether to continue purification or to proceed to sample analysis for age determination.

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