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Diverse zircon populations in Permian rhyolitic rocks from Variscan basins (Central Europe)

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Rhyolites are difficult rocks to date and often yield a range of zircon ages that could be attributed either to analytical problems or a specific scenario of rhyolite magma formation. The major challenge is to pick right zircon grains to maximize dating output with the highest precision. The scientific literature shows that, regardless of the dating technique, the careful and time-consuming screening of zircon grains is required for the best results. The screening of zircon from rhyolite rocks before dating is particularly important, because the process of rhyolite formation leads to the production of final magma containing a mixture of grains with different chemical and isotope characteristic and, therefore, potentially different ages (Pietranik et al. 2013, Słodczyk et al. 2016). In this study, we analysed different rhyolitic rocks from five Permian basins (North Sudetic Basin, South Sudetic Basin, Tharandt Basin, Chemnitz Basin and Halle Basin) by Secondary Electron Microscope equipped with Mineral Liberation Analyzer. The rhyolites are generally composed of similar mineral assemblage that includes quartz and feldspars as main phenocryst, biotite and pyroxene as major mafic phases and zircon, apatite, ilmenite and rutile as accessories. Despite the overall similarities between the studied rhyolites, zircon grains occur in different structural position, in variable mineral associations and have variable sizes depending on the studied sample. To some extent the zircon occurrence reflects the proportion of major phases in the host rock, i.e. if quartz is a dominating phase the largest proportion of zircon is associated with quartz. However, exceptions are observed for each rhyolite, e.g. almost 20% of zircon is associated with ilmenite and Fe-oxide in the rhyolite from Tharandt Basin, even though the rock contains the lowest amount of these minerals from all the studied rhyolites. The implication is that different zircon populations are present in zircon cargos of Permian rhyolites and structural position of zircon in whole rock provides relatively quick and valuable information on how to distinguish zircon belonging to these different populations. This step is necessary for further reliable dating of the rhyolites.

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