'Water' in quartz from various rhyolitic pyroclastic horizons: A new correlation tool?

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Structural hydroxyl contents of quartz grains from various rhyolitic pyroclastic density current (PDC) deposits from the Bükk Foreland Volcanic Area, Hungary, were determined by using micro-FTIR spectrometry. Additional trace element analysis and SEM cathodoluminescence imaging were also performed. Structural hydroxyl content (expressed in water equivalent) of volcanic quartz ranges from ~2,0 to ~4,1 ppm, which is lower than those in quartz of igneous, metamorphic and hydrothermal origin. The incorporation of structural hydroxyl is mainly due to coupled $H^+ + Al^{3+}$ substitutions into Si-tetrahedral vacancies of quartz. In addition, the presence of molecular water is also obvious in (nano-)inclusions. The water fugacity (*f*H2O) just prior to the eruption seems to be the main factor controlling the concentration of structural hydroxyl as manifested in its almost homogeneous distribution regardless to the zonation of Al- or Ti-content. Quartz grains from the studied volcanic units are characterized by diagnostic absorption features between 3000 and 3550 cm^{-1}, structural hydroxyl, molecular water, Al- and Ti-contents. This suggests the potential application of water content, the way of hydrogen incorporation and trace element chemistry of volcanic quartz as potential correlation tools.

Moreover, a reasonable linear correlation is observed between the integrated area of Si-O bonds-related IR absorption features (between 2110 and 1440 cm^{-1}) and sample thickness up to ~300 μm by studying unoriented quartz crystals. This may enable the analysis of separated quartz crystals without the need for preparing oriented thin sections.