

Hydrogen analysis in minerals by continuous-flow mass spectrometry

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ABSTRACT

We present a method for on-line dehydration of small quantities of hydrous and nominally anhydrous minerals followed by measurement of the absolute abundance of hydrogen released from the sample by continuous-flow mass spectrometry. This method is appropriate for measuring water content between 18 ppm and 10 wt% H₂O and requires a minimum of $\sim 2 \times 10^{-8}$ of hydrogen per analysis. The hydrogen needed for an analysis corresponds to 10–200 μg of hydrous minerals or 5–40 mg of nominally anhydrous minerals. We develop measurement protocols for garnet and pyroxene, two nominally anhydrous minerals that are potentially major reservoirs of hydrogen in the mantle.

Keywords: Hydrogen, hydrogen analysis, water content, continuous flow mass spectrometry, nominally anhydrous minerals, IRMS