Petrology 2016 vol.24 N3, pages 303-313

Prospects of the method of stepwise crushing as a source of information on the fluid phase of rocks and minerals

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Abstract

© 2016, Pleiades Publishing, Ltd.This paper illustrates opportunities provided by the method of stepwise crushing for the investigation of the fluid phase of geologic objects. Owing to the efficient separation of gases from fluid inclusions of different generations trapped during mineral growth and/or subsequent alteration (metasomatic and hydrothermal), stepwise crushing allows us to obtain the isotopic characteristics of end-members and, thus, reliably establish the source and evolution of fluids in magmatic and postmagmatic processes; this method provides clues to a better understanding of interaction of global reservoirs, such as the mantle, crust, and atmosphere. The importance of information obtained by this method is exemplified here by the results of the investigation of mantle rocks and minerals from various geologic environments (MORB, SCLM, and carbonated mantle). It was shown that the multi-isotope approach yields most comprehensive data on the genetic features and evolution of the fluid phase. The importance of combining isotope geochemical and microthermometric fluid inclusion data is demonstrated by the example of a mantle xenolith of garnet lherzolite from the Jetty Oasis. Together with the microthermometric investigation of fluid inclusions and developing laser techniques for opening of individual inclusions, the method of stepwise crushing provides a means for solving one of the most important practical problems—obtaining information on the geochemical features and physicochemical parameters of mineral-forming (and ore-forming) processes.

http://dx.doi.org/10.1134/S0869591116030024