

Oxygen stable isotopes in phosphate rocks

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Oxygen stable isotopes are very commonly used as geochemical indicators. In this study, we aim to check the possibility to apply the oxygen isotope composition of phosphate ($\delta^{18}\text{O}_p$) for identifying the origin of phosphate rocks (PRs).

Seventy-four PRs, including 4 igneous and 70 sedimentary PRs from 11 countries are analyzed in this study. The signatures of $\delta^{18}\text{O}_p$ separated the PRs into three groups: 1) igneous PRs ($\delta^{18}\text{O}_p = 5.2$ to 8.8 ‰), 2), sedimentary PRs from China plus one from Brazil ($\delta^{18}\text{O}_p = 12.2$ to 18.2 ‰), and 3), and sedimentary PRs from other countries ($\delta^{18}\text{O}_p = 18.8$ to 22.1 ‰). The depletion of $\delta^{18}\text{O}_p$ in igneous PRs is ascribed to the low concentration of ^{18}O in magmatic water. The values of $\delta^{18}\text{O}_p$ in sedimentary PRs decrease with an increasing age of the PRs. The underlying mechanisms are combination effects of the evolution of paleoclimate, paleogeographic features and other factors involved in weathering and catagenesis. This study provides a new perspective for $\delta^{18}\text{O}_p$ application, here the differentiation between sedimentary and igneous PRs and identification of different geological areas, as well as the part for establishment of the dataset for PRs from various origins, which will provide further information when $\delta^{18}\text{O}_p$ used for tracing phosphorus biogeochemical cycling in soil-plant and aquatic systems.