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ALKALINE ROCKS: PETROLOGY AND MINERALOGY

PREFACE

Compared to common basalts and granites, alkaline rocks are of minor volumetric significance. However, they more than compensate for this lack of quantity by the extreme diversity of their mineralogy and geochemistry, and by their petrogenetic complexity. The majority of mineral species have been discovered in alkaline rocks, and they are economically important sources of zirconium, niobium, tantalum, rare-earth elements, diamond, titanium, iron, and phosphorus. Isotopic studies of alkaline rocks have resulted in major revisions of our understanding of compositional heterogeneities in the lithospheric and asthenospheric mantle. Despite more than a hundred years of intense study, many questions regarding the petrogenesis of the alkaline rocks remain unresolved.

A landmark text (Sørensen, *The Alkaline Rocks*) dealing with the alkaline rocks was published in 1974. In 1984, a symposium organized by the Geological Society of London was held in Edinburgh to mark the 10th anniversary of the publication of *The Alkaline Rocks*. It seemed fitting that a 20th anniversary symposium be held to assess the progress made in the study of the petrology of the alkaline rocks. This symposium, "Petrology, Mineralogy and Geochemistry of Alkaline Rocks", sponsored by the Mineralogical Association of Canada, was held on May 16–18th during the annual meeting of the Geological Association of Canada and the Mineralogical Association of Canada in Waterloo, Ontario. That the study of the alkaline rocks is alive and well was amply demonstrated by the response of the petrological community. At the symposium, 69 oral and poster papers were presented on topics ranging from high-pressure experimental petrology of kimberlites to the mineralogy of peralkaline rare-metal pegmatites. Abstracts of these papers may be found in GAC–MAC Programs with Abstracts, volume **19**, 1994. The diversity of the presentations mirrored the diversity of the alkaline rocks, and participants had an opportunity to view the broad scope and vigor of ongoing research in a number of topical areas. The symposium had an international flavor, with a number of participants from outside North America. It was particularly gratifying, at a time when many traditional areas of geological inquiry are declining in favor of trendy environmental areas, that this symposium consistently drew the largest audience of any of the GAC–MAC sessions.

This thematic issue of *The Canadian Mineralogist* consists of twenty papers by symposium participants, and reflects the range of topics considered at the symposium. The first paper, by Woolley *et al.*, deals with what is still a contentious area, the nomenclature and classification of potassic alkaline rocks. The following paper, by O'Connor *et al.*, deals with the question of mantle metasomatism, and the paper by Pearson and Taylor, with a different type of metasomatism, *i.e.*, fenitization. The next group of papers deals with the petrogenesis of silicate alkaline rocks. Wittke and Holm consider the differentiation of a basanitic nephelinite – nepheline microsyenite sequence, and Potter assesses the impact (very little) of different basements on the chemistry of highly evolved felsic alkaline rocks. Bell *et al.* describe the rare rock-type *turjaite*, and discuss its petrogenesis. Moreau *et al.* discuss the petrogenesis of a nepheline syenite ring-structure and conclude that there has been no crustal involvement. The following paper by Landoll and Foland deals with the role of crustal contamination in the formation of quartz syenites. McHone considers alternatives to the mantle-plume model for the formation of

alkaline plutons. The next two papers, by McLemore *et al.* and Miller, describe mineralized alkaline intrusions. Barker considers the source of carbon in carbonatites, and in the following two papers, Riley *et al.* and Bulakh & Ivanikov describe, respectively, extrusive and intrusive carbonatites. The issue concludes with a group of papers dealing with the mineralogy of alkaline rocks: diopside phenocrysts in nephelinite magmas (Simonetti *et al.*), variations in pyroxene chemistry due to metamorphism (Woolley *et al.*), the development of rare minerals in a peralkaline syenite (Currie & van Breemen), carbonates in carbonatite (Zaitsev), phlogopite in carbonatite (McCormick & LeBas), and niobium and rare-earth minerals in carbonatite (Chakhmouradian). There is little doubt that the study of alkaline rocks requires a breadth of mineralogical and petrological knowledge unmatched by any other area of igneous petrology.

As the organizers of the symposium, we wish to thank all of the participants, and particularly those who chose to present their studies in this volume. We also extend our thanks to the organizing committee of the Waterloo meeting, and in particular Gwilym Roberts, who was of great help. Thanks are also expressed to the Editor, Bob Martin, for his care in insuring that the final versions of the papers meet the high standard of this journal.

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