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PACROFI VIII

PREFACE

This thematic issue of *The Canadian Mineralogist* stems from the Eighth Biennial Meeting of the Pan-American Conference on Research on Fluid Inclusions (PACROFI), which was held in Halifax, Nova Scotia, Canada, on July 7–11, 2002. At this meeting, there were 60 oral and poster presentations given by some 70 registrants from four continents and 10 countries. The success of the meeting reflected several factors, including the congenial atmosphere fostered by all attendants, and the generous financial and in kind support graciously provided by the Mineralogical Association of Canada, St. Francis Xavier University, Nova Scotia Department of Natural Resources, and Petroleum Research Atlantic Canada. The papers covered such diverse topics as experimental techniques, novel methods of analyzing both liquid and melt inclusions, models of the P–T–t of liquid petroleum inclusions, assessment of a variety of ore deposit environments, cultures of ancient micro-organisms within primary fluid inclusions in halite, and documentation of major-ion composition of seawater in the Lower Paleozoic. Collectively, the papers clearly indicate that this is a vibrant field of research with many new applications in the Earth sciences.

A representative collection of the papers presented at the meeting, which reflects the flavor of the subject material, are included in this volume, with the addition of a few timely contributions to the journal that appropriately coincided with the theme of this issue. We summarize below the salient aspects of these papers, and note that their sequence in the journal coincides with the order described below.

The continued application of analytical techniques and theoretical models to extract meaningful data from inclusions is addressed by several authors. Firstly, Linnen *et al.* measured synthetic fluid-inclusion mixtures of variable H_2O:CO_2 ratios by Fourier infrared spectroscopy to deduce an empirical equation that relates the absorbances to the H_2O:CO_2 ratio of fluid inclusions. The relationship is applicable to bulk densities corresponding to molar volumes between 30 and 50 cm^3/mol. Next, Bakker addresses the issue of determining the salinity and ion ratios in fluid inclusions by combining cryogenic Raman spectrometry and microthermometry for synthetic inclusions filled with pure H_2O, H_2O–NaCl, and H_2O–$MgCl_2$. He is able to show that integration of the two techniques allows an exact estimation of the phase changes occurring within inclusions during freezing–heating, and thus an estimate of the solute composition. Kontak presents an alternative to the cryogenetic method for determining solute composition; he images and analyzes (by electron-microprobe analysis) artificially generated evaporate mounds produced on the fluid-inclusion stage. The technique is applied to a variety of granitic environments. A more rigorous analytical technique with which to define the major-, minor- and trace-element contents of inclusions is to integrate thermometric measurements with laser-ablation ICP–MS, as discussed by Gagnon *et al.* These authors first describe the technique, then show its powerful application in a study of the nature of hydrothermal fluids in a NYF-type granitic pegmatite. On a very different experimental topic, Elwood Madden *et al.* report on innovative experimental simulation of shock-induced re-equilibration of fluid inclusions to prepare the way for an examination of inclusions in extraterrestrial objects and impact sites. Finally, Burnley & Davis use finite-element modeling to examine volume changes in fluid inclusions produced by heating and compression, which is an important aspect of post-entrapment conditions of fluid inclusions.

The application of fluid inclusions to natural occurrences is addressed in several papers, all of which deal with hydrothermal fluids of either metamorphic or magmatic origin. In two papers on Archean mesothermal lode-gold deposits of Australia, Mernagh *et al.* (Yilgarn Craton) and Baker & Seccombe (Pilbara Craton) use detailed fluid-inclusion thermometry and Raman analysis to characterize the mineralizing fluids and their environment of formation. In similar studies of fluids associated with granophile element mineralization in Devono-Carboniferous granitic rocks of Maritime Canada, Carruzzo *et al.* and Yang *et al.* integrate fluid inclusion and stable isotopic data. Interestingly, despite similarity in ages and setting, the nature of the fluids contrasts markedly between the Lake George Batholith (Au–W–Mo–Sn) of New Brunswick and the South Mountain Batholith (Cu–Mo–Mn–Sn–U–W) of Nova Scotia, with the former containing a significant CO_2–CH_4 component. In addition, Carruzzo *et al.* document the deep penetration (*i.e.*, 10–12 km) of low-salinity meteoric water during batholith emplacement. In a contrasting magma-related environment, Shin *et al.* describe As–Bi-mineralized veins from South Korea and integrate fluid-inclusion and stable isotope studies to infer the nature and origin of the fluids and the conditions of mineralization. The features of higher-level epithermal settings are addressed in two papers that integrate mineralogical studies with fluid-inclusion thermometry. Moore *et al.* describe an active geothermal system in Indonesia, in particular the consequences and behavior of descending acid-sulfate waters. In contrast, Kouzmanov *et al.* describe the genesis of a high-sulfidation vinciennite-bearing Cu–As–Sn (–Au) assemblage from a Bulgarian epithermal deposit with the important application of infrared microthermometry to study both the internal zoning and fluid inclusions within the opaque sulfide phases.

The images on the front cover of this special issue of *The Canadian Mineralogist* reflect the nature of the PACROFI meeting and the contents of some of the papers. The logo for the PACROFI VIII meeting integrates the venue of the meeting place in Maritime Canada with the character of fluid inclusions. The fluid inclusion sketched represents a hypersaline inclusion with liquid H2O, a vapor bubble and halite as a daughter mineral. Within the vapor bubble is an image of a schooner, part of the heritage of Maritime Canada, along with a light house, one of many that can still be found in picturesque coastal settings such as at Peggy's Cove, near Halifax. The two other images represent aspects of topics presented at the meeting**,** and both appear in this special issue. The negative-shape[d,] three-phase [add hyphen!] aqueous-carbonic inclusion from a Meguma gold vein in Nova Scotia is typical of the global gold**-**bearing fluid that is addressed by several authors. The last image is an SEM photo of an evaporate mound hosted by cassiterite from the East Kemptville tin deposit**,** Nova Scotia**;** decrepitation is used as a destructive method to determine the composition of the solute in the inclusions (see paper by D.J. Kontak).

The papers were reviewed with the same high standards as usual in this journal. We thank the reviewers for their helpful and constructively worded comments, and their contribution to the quality control of the articles assembled in this thematic issue.

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