Book Review

PEGMATITES by David London (2008). The Canadian Mineralogist, Special Publication 10, 347 p. CDN$125.00 ($100.00 to members of MAC), ISBN: 978-0-921294-47-4.

This book is an exhaustive study of the realm of pegmatites, the exotic late-stage crystallized products of predominately granitic intrusives. So much for the simple explanation of the content of this volume. David London brings this subject to life in such captivating detail that it was literally hard to put down. His mix of taut scientific dialog and straightforward, down-to-earth descriptions make it a joy to read this special publication involving a very complex subject. The inclusion of verbatim text from other researchers in the field, wry humor, and historic quotes put in the context of pegmatite genesis, and the ability to pull so many research factors together make for a truly original textbook. The book will appeal to a wide ranging audience: researchers, graduate students, and knowledgeable collectors of pegmatite minerals. All readers will find invaluable information in this treatise.

The book is split into two parts: Geology and Origins. The author brings his intimate knowledge of pegmatites to bear in both sections. His expert observations during field work and love of mineralogy provide insightful bonuses to the readers of the chapters in Geology. This first half, Geology, consists of the definition of pegmatites, historic models of pegmatite genesis, classification, pegmatite mineralogy, granite to pegmatite transition and pegmatite types (common, rare-element, miarolitic, and non-granitic). The first three chapters, Definition, Historic Models, and Classification, are used to set up the main thrust of the book, which is pegmatite genesis. Chapter 4, Mineralogy, which is over 50 pages long, is full of mineral photographs from the author's collection. Every specimen is not just beautiful, but also displays a significant property of pegmatite formation. The remaining chapters in the first half of the volume describe various pegmatite types (shallow vs. deep emplacement, common, rare earth, miarolitic, and non-granitic). London not only presents thorough descriptions of each type, but also uses field examples to drive home his points effectively. Especially illuminating are his insights on the rare-earth-bearing pegmatite at the Tanco Mine in Manitoba, Canada, and the miarolitic pegmatite at the Little Three Mine in San Diego County, California.

The second part of the book, Origins, is extremely thought provoking and develops a new standard for pegmatite genesis. The author starts this portion of the book by laying the foundation for the scientific arguments to be discussed later. Chapter 10, Pegmatite Sources and their Chemical Signatures, dives into element partitioning and source plutons. The next two chapters present a comprehensive discussion of fractionation trends and crystallization of rare-element minerals in pegmatites. In Chapter 13, London takes a revealing look at the Jahns-Burnham model, which has stood the test of time for nearly 50 years. The end result is boiled down to two fundamental questions, (1) do granitic melts become saturated with an aqueous vapor phase, and (2) do alkali-elements fractionate between melt and vapor as per the Jahns-Burnham model? London is able to refute both keystones of their model, first showing that vapor-phase saturation does not occur in the early stages of pegmatite formation and then uses several lines of research and experimental work from his laboratory (Chapter 14) to show that there is no significant alkali fractionation between melt and vapor. The true beauty of his experimental research is captured in Figure 14-11, which shows a boron-rich boundary displayed in an H_2O-undersaturated and supercooled granitic melt. This boundary signifies constitutional zone refining, the crux of London's pegmatite genesis model. That singular experimental run could be envisioned as the turning point in the understanding of pegmatites. Chapters 15 and 16 explore in detail the pressure-temperature conditions and rheological properties of pegmatites, respectively. Finally, in Chapter 17, London presents in great detail (40 pages) the model of pegmatite genesis that he has worked on for the last 30 years. In simple terms, pegmatite formation can be understood by the response of a flux-bearing silicate melt to significant undercooling below the liquidus.

Some of the most interesting components of this book include the images of large scale polished pegmatite rock slabs, the summary paragraph at the beginning of each chapter, the enclosed CD of all figures within the book, and the epilogue. The rock slabs allow the author to bring field pegmatite exposures into the context of the book. Each summary paragraph gives the reader a clear idea of what lies ahead in each chapter, allowing the book owner to skip, peruse, or delve in to the individual chapter. The figures on the CD in JPEG form will be quite useful to professors that decide to use this volume as a textbook. Chapter 18, the epilogue, allows pegmatite petrologists and students a tantalizing peek into new fields of research just begging to be tackled. Perhaps the only flaw in the book, albeit a small one, is that the figure captions sometimes wrap onto the following page.

To sum it up, this is a book that should reside in the bookcase of every petrologist, serious geology student, and lay mineralogist interested in pegmatites. This is a masterful piece of work that is well laid out and carefully written to tackle and resolve a geologic problem that has mystified many a geologist.

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