LETTER

Discreditation of diomignite and its petrologic implications

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ABSTRACT

Diomignite (Li₂B₄O₇) is discredited as a mineral species, and this discreditation has been approved by the International Mineralogical Association, Commission on New Minerals, Nomenclature and Classification. Diomignite was originally reported to occur in virtually every crystal-rich inclusion in spodumene from the Tanco pegmatite in southeastern Manitoba, Canada. However, detailed study of 30 randomly selected crystal-rich inclusions in the purported type material deposited at the U.S. National Museum of Natural History, 30 inclusions in the purported type material from the American Museum of Natural History, and several hundred inclusions in self-collected samples reveals that diomignite is absent in every inclusion examined. Because no holotype specimen exists and no neotype sample was provided by the surviving authors of the original description, the presence of diomignite could not be validated. The evidence provided in the original description to the IMA in 1984 is shown to be insufficient to support the existence of diomignite as a mineral species.

The previously reported boron-rich (12 mass% B₂O₃) composition of the melt represented as crystal-rich inclusions in spodumene and petalite from the Tanco pegmatite was predicated on the assumption that diomignite is a common daughter mineral that occurs in most inclusions and that the inclusions are primary melt inclusions. The nonexistence of diomignite, and the absence of other borate daughter minerals, in these crystal-rich inclusions indicates that the boron content was greatly overestimated and so comparisons to experimentally generated boron-rich (>10 mass% B₂O₃) boundary-layer melts are unwarranted. Furthermore, the discreditation of diomignite negates the inferred role of a Li₂B₄O₇-flux-rich melt in the generation of primary pegmatite textures and rare element oxide mineralization in the Tanco pegmatite.

Keywords: Diomignite, discreditation, pegmatite, inclusions, boron, internal evolution

INTRODUCTION

London et al. (1987) reported diomignite (Li₂B₄O₇) as a new mineral from the Tanco pegmatite in southeastern Manitoba, Canada. It was the first mineral species to be described solely as a daughter mineral in fluid inclusions, following approval in 1984 (IMA 84-58) by the International Mineralogical Association, Commission on New Minerals and Mineral Names, currently Commission on New Minerals, Nomenclature and Classification (CNMNC). Detailed examination of several hundred spodumene-hosted inclusions from the Tanco pegmatite shows that the evidence presented in the original description of diomignite is insufficient to warrant valid mineral species status. Discreditation of diomignite was officially approved by the CNMNC in January 2016 (decision 15-H). This paper reviews the lines of evidence presented in the original description and calls into question the origin of the crystal-rich inclusions (London 2008), the estimated composition of the entrapped fluid (London 1986), and the inferred role of a Li₂B₄O₇ flux-rich melt in the internal evolution of the Tanco pegmatite (London 1985, 1986) and the alteration of the wall rocks (Morgan and London 1987; London 2008).

Diomignite was reported to be part of an assemblage of daughter minerals that includes albite, cookeite, quartz, pollucite-analcime solid solution, a microlite-group mineral and an unidentified carbonate mineral within spodumene-hosted fluid inclusions from the Tanco pegmatite, Manitoba, Canada. According to London et al. (1987):

Diomignite has been observed only as small (≤30 μm) anhedral to euhedral crystals in fluid inclusions in spodumene, and tentatively in fluid inclusions in the petalite from which most of the spodumene formed. In these associations, diomignite is an abundant and widely distributed phase; it occurs in virtually every crystal-rich inclusion in spodumene.

However, examination of several hundred of the same type of inclusions in self-collected samples, and in 30 crystal-rich inclusions in samples deposited as type material at the U.S. National Museum of Natural History, and in 30 inclusions in samples deposited as type material at the American Museum of Natural History, shows that most inclusions contain only quartz, zabuyelite, cookeite, and a low salinity aqueous or aqueous carbonic fluid (see supplemental material†). Despite an exhaustive search, no inclusions were shown to contain crystals of lithium tetraborate.

Thomas and Davidson (2010) reported a second occurrence

† Deposit item AM-16-75757, Supplemental Material. Deposit items are free to all readers and found on the MSA web site, via the specific issue’s Table of Contents (go to http://www.minsocam.org/MSA/AmMin/TOC/).