

A new, sodian end-member of the epidote group in new members of the polysomatic epidote-törnebohmite series (i.e. the gatelite group)

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Greyish green crystals resembling gatelite-(Ce) were found by one of the authors (T.A.H.) in yttrian fluorite masses from several pegmatites of the Tysfjord granite, northern Norway. These pegmatites host a wealth of REE- and Y-bearing silicates, REE-bearing carbonates and niobian oxides [1], among which several new REE minerals, e.g. hundholmenite-(Y), stetindite, fluorbritholite-(Y) and atelinite-(Y) (IMA 2010-065). Allanite-(Ce), bastnäsite-(Ce) and törnebohmite-(Ce) are common accessories in the fluorite masses and BSE images show that the 'gatelite-like' crystals may be intergrown with törnebohmite-(Ce) down to a submicrometric scale.

Actually, the structure of these gatelite-like crystals can be regarded as a regular alternation of (001) epidote-type slabs (E) and (-102) törnebohmite-type slabs (T). They belong to the group of minerals that can be regarded as ET polysomes of a polysomatic series having epidote and törnebohmite as end-members. Such a group includes gatelite-(Ce) [2], västmanlandite-(Ce) [3] and an unnamed mineral from the Bergslagen mining region of south-central Sweden ([4], UM2007-35). In all these minerals the T module exhibits the same composition, REE₂Al[SiO₄]₂(OH), whereas the composition of the E module differentiates each member, e.g. dissakisite-(Ce) composition in gatelite-(Ce), dollaseite-(Ce) composition in västmanlandite-(Ce).

The polysomatic material from Tysfjord shows a wide compositional range between crystals but also within zoned crystals, from relatively Al-rich, Fe-poor core compositions to Fe- and REE-rich, Al-poor overgrowths. A structural and chemical study reveals a nearly continuous series between two end-members, (Ce)₃CaAl(Al₂)(Fe²⁺)[Si₂O₇][SiO₄]₃O(OH)₂, and (Ce_{2.5}Na_{0.5})CaAl₂Al₂[Si₂O₇][SiO₄]₃O(OH)₂. This leads to the definition of two new members of the polysomatic gatelite group, the former (IMA2011-55) with allanite-(Ce) as the E module, the latter (IMA2012-xx) with a new end-member of the epidote group as E module, namely (Ce_{0.5}Na_{0.5})CaAl₃[Si₂O₇][SiO₄]O(OH).

This first sodian epidote-group end-member demonstrates that REE incorporation in the epidote structure can be charge-balanced in the A site by Na incorporation and calls for a reappraisal of the role of Na in the crystal-chemistry and analysis of any mineral of the allanite subgroup [5, 6].

References

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