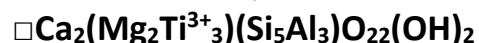


**Two new super-reduced phases from Luobusa chromitite: jianmuite,  $\text{ZrTi}^{4+}\text{Ti}^{3+}_5\text{Al}_3\text{O}_{16}$ , and a  $\text{Ti}^{3+}$ -rich calcium amphibole,**



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*Session 33: New Minerals, Nomenclature and Classification (Theme 14: Planetary minerals and evolution with time)*

Corundum from the Cr-11 chromitite orebody in the Luobusa ophiolite near Kangjinla (Tibet, China) [1] contain a great variety of ultra-reduced inclusions (URIs, i.e. phases without oxygen, e.g. phosphides, silicides, nitride) and super-reduced inclusions (SRIs, i.e. phases with oxygen, but also with metals in an unusual, reduced state, e.g.  $\text{Ti}^{3+}$ ). Given the micrometric to sub-micrometric size of these inclusions, their chemical and structural characterization is only possible by using advanced analytical protocols that involve a focused ion beam (FIB) and transmission electron microscope (TEM). In particular, three-dimensional electron diffraction (3DED) [2] combined with programs for the dynamical refinement (i.e., structural refinement that takes into account dynamical scattering) [3] constitute powerful tools to solve the structure of crystal phases that are too small for conventional single-crystal X-ray diffraction methods. In this work, we present two new phases found as SRIs in a FIB lamella from a corundum grain extracted from the Cr-11 orebody.

Jianmuite, ideally  $\text{ZrTi}^{4+}\text{Ti}^{3+}_5\text{Al}_3\text{O}_{16}$  [4], is a Zr-Ti-Al-oxide similar in chemistry and paragenesis to carmeltazite,  $\text{ZrAl}_2\text{Ti}^{3+}_4\text{O}_{11}$  [5], but with a space group *I*-4, *a* = 10.3675(10) Å, *c* = 9.8125(10) Å. Remarkably, this mineral was also found among refractory phases in the matrix of the Allende meteorite, a CV3 carbonaceous chondrite. In the same lamella, we also found another potential new mineral, with a structure consistent with the amphibole supergroup [6], but a novel composition with the ideal formula  $\square\text{Ca}_2(\text{Mg}_2\text{Ti}^{3+}_3)(\text{Si}_5\text{Al}_3)\text{O}_{22}(\text{OH})_2$ . The charge arrangement is unique as is  $\text{Ti}^{3+}$  being the dominant trivalent C cation (through the hypothetical homovalent substitution  $^{\text{C}}\text{Al}^{3+} = ^{\text{C}}\text{Ti}^{3+}$ ), so a new rootname and the prefix “titano-” (never used so far in the amphibole supergroup) are needed. The occurrence of  $\text{Ti}^{3+}$  in terrestrial minerals is petrologically significant as it constrains the redox conditions under which the  $\text{Ti}^{3+}$ -bearing minerals crystallized.

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