## Concept of Transformation Mineral Species and Varieties

KHOMYAKOV, A.P., Institute of Mineralogy, Geochemistry, and Crystal Chemistry of Rare Elements, Moscow, Russia

Transformation mineral species (TMS) are a special genetic group of species that, in contrast to ordinary minerals, are incapable of crystallizing from melts or solutions, but can only form as pseudomorphs after their mineral protophases. From the latter, TMS inherit their main compositional and structural features, producing evolutionary sequences of the type "primary mineral → TMS" (lomonosovite → murmanite, zirsinalite → lovozerite, etc.), in which each newly formed phase has its unique corresponding protomineral. The unambiguous correspondence between the primary and secondary minerals in these evolutionary sequences opens up major opportunities for solving various problems, especially in genetic and technological mineralogy (e.g., in reconstructing the primary mineral composition of rocks and ores from their alteration products).

There is one fundamental difference between the special genetic group of mineral species described above and those transformation varieties of ordinary minerals that are produced by the same mechanism as TMS. An example of a transformation variety are vinogradovite pseudomorphs after lorenzenite, which are typical of highly alkaline rocks of the Khibina and Lovozero nepheline syenite massifs (Kola Peninsula). However, this is not the only way in which vinogradovite can form. In the same rocks, it much more frequently crystallizes independently of any precursors and forms its own euhedral crystals.