The Nature of Garnierites—I Structures, Chemical Compositions and Color Characteristics

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Abstract: X-ray diffraction patterns of garnierites indicate that most samples resemble serpentine-group minerals or a talc-like mineral, or a mixture of these forms, and give respectively 7 Å and 10 Å basal reflections. From a survey of some 40 garnierites, four of predominantly serpentine type and seven of predominantly talc-like type were selected for detailed study. The talc-like garnierites exhibit little variation of the 10 Å basal spacing with low-temperature heating or with immersion in liquids, though some may contain a small proportion of expandable layers. Chemical analyses show considerable deviations of octahedral/tetrahedral cation ratios from the values 3/2 and 3/4 for normal serpentine and talc minerals, and may be interpreted in terms of mixed 1:1 and 2:1 layer types, either as separate phases and/or as interstratifications, or as defect structures of various kinds. The H_2O+ contents of the talc-like forms of garnierite are considerably greater than that of normal talc and point to a mineral of composition $3(Mg, Ni)O \cdot 4SiO_2 . 2H_2O$ or $[(Mg, Ni)_3Si_4O_{10}(OH)_2] \cdot H_2O$—a talc monohydrate formula. The green color of garnierites is related to the NiO weight per cent and a color index is derived based on the Munsell color charts.

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