A New Approach to Compositional Limits for Sepiolite and Palygorskite

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Abstract: Most bulk chemical analyses of sepiolite and palygorskite available in the literature are erroneous because samples analyzed are admixtures of minerals that are difficult to separate or identity by other techniques. Some chemical analyses performed on selected individual particles by energy dispersive X-ray analysis (EDX) are also influenced by the same problem. Chemical analyses are summarized for sepiolite and palygorskite reported in the literature (bulk and EDX analyses). The analyses are evaluated by comparison to three sepiolite and three palygorskite pure samples analyzed by EDX techniques. Results indicate that sepiolite is a true trioctahedral mineral, very pure (near end-member) with negligible structural substitution and with eight octahedral positions filled with magnesium, close to the theoretical formula $Mg_8Si_{12}O_{30}(OH)_4(OH_2)_4(H_2O)_8$. Palygorskite is intermediate between di- and trioctahedral phyllosilicates. The octahedral sheet contains mainly Mg, Al, and Fe with a R^2/R^3 ratio close to 1, and with four of the five structural positions occupied. The theoretical formula is close to $(Mg_2R_2^{3+}\square_1)(Si_{8-x}Al_x)O_{20}(OH)_2(OH_2)_4 \cdot R^{2+}_{x/2}(H_2O)_4$, where $x \approx 0 - 0.5$. Sepiolite and palygorskite are thus more compositionally limited than previously reported.

Key Words: Chemical Composition • Palygorskite • Sepiolite

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