## SPECTRUM OF Ni<sup>2+</sup> IN GARNIERITE --- REPLY

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In view of the reply of Reddy & Lakshman to my discussion on the optical absorption spectrum of garnierite (Faye 1974), I maintain that the theoretical arguments and experimental spectroscopic evidence continue to show that  $Ni^{2+}$  has pseudo-octahedral site symmetry in garnierite, as expected on structural and thermodynamic grounds. This evidence is not in accord with the proposal by Lakshman & Reddy (1973) that  $Ni^{2+}$  has tetrahedral site symmetry in garnierite, consequently they should have at least considered the issues raised in my discussion before rejecting the case for six-coordinate  $Ni^{2+}$ . In fact, they ignored essentially all of the arguments presented in the discussion.

Reddy & Lakshman attempt to defend their position solely on the grounds that I considered only a spectrum measured at room temperature rather than one recorded at liquid-air temperature ( $\sim 90^{\circ}$ K). Although absorption bands may be sharpened somewhat and fine structure due to spin-orbit coupling may be partly resolved at low temperature in certain solid-state spectra, this has no practical consequence in the present case of pseudo-octahedral Ni<sup>2+</sup> in garnierite. The room-temperature spectrum clearly reveals the three spin-allowed *d*-*d* bands, due to the transitions  ${}^{3}A_{2}(F) \rightarrow {}^{3}T_{2}(F), {}^{3}A_{2}(F) \rightarrow {}^{3}T_{1}(F)$  and  ${}^{3}A_{2}(F) \rightarrow {}^{3}T_{1}(P)$ , which characterize the wellknown, indeed classic, spectrum of octahedrally coordinated Ni<sup>2+</sup> in oxo species (e.g. Burns 1970, p. 157; Cotton & Wilkinson 1972, p. 894). That Lakshman & Reddy were not able to detect the 26,300-cm<sup>-1</sup> band due to the  ${}^{3}A_{2}(F) \rightarrow$  ${}^{3}T_{1}(P)$  transition and then attempt to confound the discussion by concluding that this easilyresolved low-intensity feature (extinction coefficient of  $\sim 5$  to 10/mole-cm) is a charge-transfer band attests to the frailty of their case.

Reddy & Lakshman emphasize that, in my original note (Faye 1971), I did not explicitly state that  $Ni^{2+}$  was the ion responsible for the three bands at 26,300, 15,200 and 9,100 cm<sup>-1</sup> in the mull spectrum of a garnierite specimen. This oversight is trivial in view of the fact that nickel at a concentration of 39% was the only transition metal present that could possibly generate such a spectrum.

Although the arguments presented in my previous discussion could be re-stated and enlarged upon for emphasis, this would consume space unnecessarily and would serve no useful purpose, especially in view of the fact that Reddy & Lakshman have not presented any additional evidence to substantiate the case for tetrahedrally-coordinated  $Ni^{2+}$  in garnierite.

## References

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