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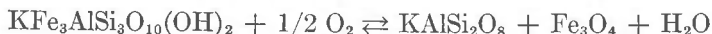
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#### STABILITY OF BIOTITE: A REPLY

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Mueller's (1972) proposed for an ideal solution model for biotite stabilities is sound, and his model is correct for biotites with low  $Fe^{3+}$  contents. Wones, Burns, and Carroll (1971) redetermined the stability of the end member, annite,  $KFe_3AlSi_3O_{10}(OH)_2$ . New data on Ni-NiO (Huebner and Sato, 1970) and  $Fe_2SiO_5$ - $SiO_2$ - $Fe_3O_4$  (Wones and Gilbert, 1969) are also available. This led to a correction of the so-called

"standard state" on which the biotite solution theory of Wones and Eugster (1965) was based. As a consequence an "ideal" model seems most likely for biotites on the join phlogopite-annite. For the reaction



an expression relating mole fraction  $\text{Fe}^{2+}$ ,  $x$ ; temperature,  $T$ ; and the fugacities of oxygen ( $f_{\text{O}_2}$ ) and  $\text{H}_2\text{O}$  ( $f_{\text{H}_2\text{O}}$ ) is as follows:

$$\log f_{\text{H}_2\text{O}} = 7409/T + 4.25 + 1/2 \log f_{\text{O}_2} + 3 \log x \\ - \log a_{\text{KAlSi}_3\text{O}_8} - \log a_{\text{Fe}_3\text{O}_4}.$$

This permits new estimates of  $\text{H}_2\text{O}$  fugacity in the rhyolite of the San Juans and gneisses of the Adirondacks:

	old estimate	new estimate
Piedra rhyolite	200-600 bars	200-2000 bars
Adirondack gneiss		
500°	0.1-1 bars	1-10 bars
600°	1-10 bars	10-50 bars

F. J. Turner (1970) has protested the earlier values estimated for the Adirondack gneisses. Although the new estimates are somewhat higher, they do not come up to Turner's expectations, which are based on the stability of muscovite. The data on the stability of amphibole is in agreement with the new estimates of  $f_{\text{H}_2\text{O}}$  for regional metamorphism of the intercalated gneisses and marbles of the Northwest Adirondacks, and makes sense for a series of decarbonation reactions.

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