Clays and Clay Minerals, 1970, Vol. 18, p. 67. Pergamon Press. Printed in Great Britain

LETTERS TO THE EDITOR

ON POTASSIUM RELEASE FROM MICAS

A Comment to Reichenbach, H. and Rich C. I. (1969) Potassium release from muscovite, *Clays and Clay Minerals* **17**, 23–29.

THE EFFECT of grinding on muscovite has been studied by Mackenzie and Meldau (1956) and Bartha and Bruthans (1961). In careful wet-grinding experiments (Lodding, 1967), I found that the silica content of the solid muscovite stays essentially constant, but potash is reduced considerably. Grinding for 90 min reduced the K_2O content from 10·05 to 8·50 per cent, and wet-grinding for 24 hr reduced it to 5·30 per cent. Reichenbach and Rich do not mention how long they ground the muscovite before fractionation. Their "untreated" $< 0{\cdot}08\,\mu$ fraction (in Fig. 3) clearly shows the presence of a large low-angle shoulder, indicative of hydrated or altered muscovite. The authors' finding that more K is released by $BaCl_2$ treatment from coarse muscovite than from fine fractions is probably the result of alteration and partial K-removal by wet-grinding. That more K is removed by subsequent treatment with $BaCl_2$ can be explained by the removal of strain during grinding (Lodding, 1967), and the introduction of new structure dislocations. It stands to reason that potential energy and, therefore, chemical reactivity in such a system are larger in the larger size fractions regardless of the smaller surface area. In order to obtain meaningful data on the K-removal from muscovite by $BaCl_2$ one would have to first separate this mineral from other minerals present and then one would have to fractionate the purified muscovite into size fractions without any grinding.

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Clays and Clay Minerals, 1970, Vol. 18, pp. 67–68. Pergamon Press. Printed in Great Britain

Reply to William Lodding's comment on Reichenbach, H. G. von, and Rich, C. I.: Potassium release from muscovite as influenced by particle size. *Clays and Clay Minerals*, **17**, 23–29.

THE K analyses of the "untreated" muscovite fractions were as follows:

Fraction [microns] $< 0{\cdot}08$	Total K [Meq/100g (300°C wt. basis)] Not analyzed
0·08–0·2	175
0·2–2	206
2–5	222
5–20	223

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All of the material originated from the same crystal of muscovite, but particles of different size were separated after wet grinding in an Omnimixer for about 2 hr. We attributed the lower K content as well as lower SiO_2/Al_2O_3 ratios (original article) of the finer fractions to weathering during preparation of these fractions. Mackenzie and Milne (1953) obtained similar results on grinding a mica sample but without separation. Although it is realized that the initial K contents of the fractions were initially different, the continued much higher K release rates of the coarse particles even after much of the K had been exchanged shows that the differences in initial K contents cannot explain our results. The persistence of a 10·6 Å X-ray diffraction peak in the $< 0{\cdot}08$ fraction and the 10·91 Å peak in the 0·2–2 fraction also indicates the persistence of K in mica layers.

The main concern of our paper was to show that K-selectivities were higher for small particles. The experimental conditions chosen favored equilibrium so that K-selectivity determined K-release. Total K content of the minerals or total K in the exchange system per se do not affect K selectivity.

Some internal strain may have been released by grinding, but the strain induced by exchange of K by hydrated cations with peripheral expansion of particles appears to us to be greater and more important in explaining our results.

The suggestion to obtain naturally occurring identical minerals of different particle size does not appear to be very realistic. Naturally occurring muscovite of the size range studied – if available – probably already would be more variable because of natural weathering or original compositional differences than those particles separated after wet grinding a large crystal. If available, such a system, of course, would be preferred.

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