

H₂O and the dehydroxylation of phyllosilicates: An infrared spectroscopic study

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ABSTRACT

As shown by in situ infrared spectroscopy and analysis of quenched samples, phyllosilicates (muscovite, sericite, pyrophyllite, and talc) under dehydroxylation conditions lack the characteristic bands near 1600 cm⁻¹ (bending) and 5200 cm⁻¹ (combination) of H₂O, and they contain virtually no H₂O but an abundance of OH. This observation appears to be at variance with the formal description of dehydroxylation in bulk samples as 2(OH) → H₂O + O, whereas it is suggested that hydrogen diffuses in the form of (OH)⁻ or/and H⁺ in dehydroxylation. The upper limit of H₂O in the dehydroxylated bulk is likely to be at the parts per million level in phyllosilicates that contain structural OH ions equivalent to 4–5 wt% H₂O. The observations suggest that H₂O molecules are probably formed near the surface of the sample.

Keywords: Dehydroxylation, phyllosilicates, H₂O, infrared spectroscopy