
Origin, Diagenesis, and Mineralogy of Chlorite Minerals in Devonian Lacustrine Mudrocks, Orcadian Basin, Scotland

S. Hillier¹

Department of Geology, University of Southampton, Southampton SO9, 5BP, U.K.
Laboratoire de Géologie, Ecole Normale Supérieure, 24 rue Lhomond, 75231 Paris, France

¹ Present address: Geologisches Institut Universität Bern, Baltzerstrasse 1, CH3012, Bern, Switzerland.

Abstract: Chlorite and corrensite are common clay minerals in lacustrine mudrocks from the Devonian Orcadian Basin, Scotland. The relationship of their occurrence to vitrinite reflectance data demonstrate that they are authigenic minerals, formed during burial diagenesis/metamorphism at temperatures of $\geq 120^\circ$ C. Whole rock mineralogical and chemical analyses show that chlorite authigenesis occurred by reactions between the detrital dioctahedral clay mineral assemblage and dolomite that was formed under early evaporitic conditions in the lacustrine environment.

XRD and electron microprobe analyses indicate that phases intermediate between corrensite and chlorite are probably mixed-layer chlorite/corrensite with a tendency towards segregation of layer types. Chemically, the conversion of corrensite to chlorite involves an increase in Al for Si substitution in tetrahedral sites, but there is no change in the Fe/Mg ratio of octahedral cations. There is also no relationship of mixed-layer proportions to paleotemperature; only a general paleotemperature interval of approximately 120° to 260° C in which a range of phases between corrensite and chlorite occurs. Chlorite polytypes are exclusively IIb, indicating the formation of this polytype at diagenetic temperatures.

The occurrence of corrensite and Mg-rich chlorite in evaporite and carbonate successions is probably a reliable indicator of diagenetic alteration at temperatures of $\geq 100^\circ$ C. Burial diagenetic reactions between dioctahedral clay minerals and Mg-rich carbonates may possibly explain many occurrences of corrensite and Mg-rich chlorite in such rocks.

Key Words: Chlorite • Corrensite • Diagenesis • Dolomite • Vitrinite Reflectance

Clays and Clay Minerals; April 1993 v. 41; no. 2; p. 240-259; DOI: [10.1346/CCMN.1993.0410211](https://doi.org/10.1346/CCMN.1993.0410211)
© 1993, The Clay Minerals Society
Clay Minerals Society (www.clays.org)
