

Retrogression of metamorphic phyllosilicates in low-grade rocks

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Although reaction progress of phyllosilicates is fairly well understood in prograde diagenetic and low-temperature metamorphic systems, very little is known about retrogression of metamorphic phyllosilicates caused by geologic events that followed peak metamorphism. Such phyllosilicate retrogression may considerably modify empirical parameters like illite and chlorite crystallinity that are used for determining diagenetic and metamorphic zones.

Conventional XRD analysis is usually inadequate to show initial signs of retrogression. By contrast, HRTEM observations on phyllosilicate crystallites allow characterization of even small changes induced by retrograde events. Samples that demonstrate various cases of phyllosilicate retrogression from Paleozoic and Mesozoic clastic sedimentary and basic- to intermediate-igneous formations of the Bükkium (innermost Western Carpathians, Hungary) that underwent Alpine (Cretaceous) orogenic metamorphism. Mylonitization and hydrothermal-metasomatic alteration, both distinctly separated in time from the main metamorphic phase, resulted in disordered and ordered (corrensitic) chlorite/smectite mixed-layers and berthierine growing or forming transitions at the rims of large chlorite crystallites. On the basis of textural observations, these products of retrogression can be easily distinguished from the chlorite and K-white mica assemblages of prograde anchizonal and epizonal metamorphism.