GEOTHERMOMETRY ON LOW-TEMPERATURE METAMORPHIC AREAS:
PRELIMINARY RESULTS OF CLAY MINERALOGY IN THE BUÇACO SYNCLINE,
CENTRAL PORTUGAL

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Different geothermometers can be used on areas affected
by low-temperature metamorphism. Fluid inclusion data,
illite or chlorite "crystallinities" and vitrinite reflectance are
quite widely used parameters. A scientific program for the
assessment of the above mentioned geothermometer data
consistency in various Portuguese low grade metamorphic
formations has been established and is under development. In
Buçaco syncline, Central Portugal, the first results obtained
on graptolite remains and fluid inclusions proved a general
good agreement of different geothermometric parameters and
established some of the general features of the metamorphic
framework (Dória et al., 2002).

The main goal of this work is to present recent data con-
cerning clay mineralogy (in particular, illite and chlorite "crys-
tallinities") and to compare these results with those from orga-
nic petrology and fluid inclusion study of these metapelitic
materials.

In the Central Iberian zone (CIZ) of Portugal, several anti-
clines and synclines occur in which a Lower Palaeozoic
sequence overlays Precambrian-Cambrian metasediments. The
Early Ordovician to Early Devonian rocks were affected by
very low to low-temperature metamorphism during the Varis-
can orogeny. The stratigraphical sequence comprises a series
of detrital rocks (conglomerates, quartzites, slates and black
shales) in a general transgressive sequence. In the Upper Ordo-
vician a volcanic succession of diabases and intrusive dolerites
is also present. The Buçaco syncline, in Central Portugal, pre-
sents an almost continuous sequence from Lower Ordovician
to Silurian. Above an unconformity upper Carboniferous ter-
restrial sediments also occurs. Several Cretaceous and Quater-
nary sediments cover part of the syncline.

For the development of the scientific program of testing
geothermometer data consistency, a first sampling campaign
was carried out in lithologies of different ages in the Buçaco
syncline. A total of 30 samples from 5 geological sections
(Dornes, Penacova, Poiares, Ceira and Buçaco) were col-
lected. For each sample the mineralogical composition of
both total rock and clay fraction (separated by sedimentation,
according to Stokes law), was determined by X-ray diffraction
(CuKα-radiation) on Philips PW1130/90 and X’Pert
PW3040/60 equipments. The clay fraction (< 2 μm) was anal-
ysed on oriented aggregates. Qualitative and semi-quantita-
tive mineralogical analyses followed criteria recommended
by Schultz (1964), Thorez (1976), Mellinger (1979) and
Pevear and Mumpton (1989). Illite "crystallinity" was assessed
through the Kübler (1964) index, according to Kisch (1991).
Esquevin (1969) index was also assessed.

The results show some consistency with a range of tem-
peratures from 150°C to 200°C in the Lower to Middle
Ordovician and of 100°C to 150°C in the upper Ordovician
to Silurian. In the near future, the investigation will proceed
on the basis of additional sampling for statistical validation
of the preliminary results herein presented.

References
Esquevin (1969): Bulletin du Centre de Recherches de Pau,
3, 147–154.
Kisch, H. J. (1991): Journal of Metamorphic Geology, 9,
665–670.
Kübler, B. (1964): Revue de l’Institut Français du Pétrole,
19, 1093–1112.
Report, G79: 1–16.
Lectures I. Clay Minerals Society, Colorado (USA).
Schultz, L. G. (1964): U. S. Geological Survey Profes-