European Mineralogical Conference
Vol. 1, EMC2012-349, 2012
European Mineralogical Conference 2012

$^{40}Ar/^{39}Ar$ encapsulation ages of schists from Carboneras and Palomares Faults of Trans-Alboran Shear Zone (Betic Cordillera, SE Spain)

I. Abad (1), J. Jiménez-Millán (1), A.M. Schleicher (2), and B.A. van der Pluijm (2)

(1) Departamento de Geología, Universidad de Jaén, Jaén, Spain (miabad@ujaen.es), (2) Department of Geological Sciences, University of Michigan, Ann Arbor, U.S.A.

The Neogene and Quaternary faulting activity in the southeastern Iberian Margin (Trans-Alboran Shear Zone) is dominated by a large NE-SW left-lateral strike-slip system including the Palomeras and the Carboneras faults. These fault zones juxtapose lithologies subjected to intense cataclasis that can affect the regional fluid flow and the mechanical behaviour of the faults. Shear lenses of post-orogenic sediments and volcanic rocks of Miocene and Pliocene ages are juxtaposed to the predominant slaty gouges of the Alpine basement (mica schist, phyllite and quartzite derived from Permo-Triassic sediments).

Faulted rocks and their respective protoliths have been collected from two areas: a) the Rambla de la Granatilla valley in the Carboneras fault area and b) the fault lenses outcropping between the localities of Mojácar and Garrucha in the Palomares fault area. Both areas expose sections with a thickness of nearly 200 m of fault gouges and protoliths showing a complex arrangement of shear lenses of the different fault rock types.

The mica schists have been characterized by X-ray diffraction and electron microscopy (SEM/EDX and TEM). In addition, two samples were selected for $^{40}Ar/^{39}Ar$ dating of clay grain-size fractions using illite polytypes quantification.

Chlorite, K-white mica, quartz and Fe-oxides are the principal phases in all samples. The protolithic samples show also biotite, whereas the fault rocks show additional alteration of biotite to kaolinite. There are chemical differences in micas (illitic and phengitic vs. muscovitic) while chlorites are mainly chamositic (Mg-rich) in composition.

Ar ages of Carboneras fault rocks indicate an earlier history at $\approx$ 25 Ma (age of the detrital component) and a more recent event at $\approx$ 12 Ma (age of the authigenic component). The Palomares fault area sample shows non-systematic changes in age with grain size, but seems to be fully reset at $\approx$ 8 Ma.

These results suggest clay growth along the fault zones related to fault activity or merely using the fault zones as conduits for magmatic-originating fluids (without fault activity). The older age is interpreted as a cooling age of the $2M_1$ micas, reflecting the end of the crustal collision that produced the metamorphic complexes belonging to the Alboran domain and the beginning of postorogenic extension. The Alboran terrain collided with the South Iberian and Maghrebian passive margins during the Miocene, forming the Gibraltar arc and the Betic and Rif ranges (Booth-Rea et al. 2005). The younger ages represent a growth episode of phyllosilicates likely reflecting hydrothermal alteration related with the ultrapotassic volcanism in this area. The volcanic activity in the Cabo de Gata area began $\approx$ 12 Ma ago with younger ages to the NE (Duggen et al. 2004), which is in excellent agreement with our results.

Acknowledgements

This research has been funded by the Universidad de Jaén (Research Project R1/12/2010/01 sponsored by Caja Rural de Jaén) and Research Group RNM325 of the Junta de Andalucía.

References

Booth-Rea G., Azañón J.M., Martínez-Martínez J.M., Vidal O., and García-Dueñas V. (2005) Contrasting structural and P–T evolution of tectonic units in the southeastern Betics: key for understanding the exhumation of the Alboran Domain HP/LT crustal rocks (western Mediterranean). Tectonics, 24: TC2009.

Duggen S., Hoernle K., van den Bogaard P., and Harris C. (2004) Magmatic evolution of the Alboran Region: the role of subduction in forming the western Mediterranean and causing the Messinian Salinity Crisis. Earth and Planetary Science Letters 218: 91-108.