Sr and Ar diffusion systematics in polygenetic white micas from Naxos

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Metamorphic ages from Naxos (blueschist, greenschist retrogression) are inconsistent [1-3]. To resolve the contradictions we combine electron microprobe maps of white mica (WM) with multichronometry. All WM consist of ≥ 2 heterochemical generations, explaining [4] why Rb-Sr isochrons have MSWD >30. As in other polymetamorphic rocks [5], the 500-160 µm and 90-160 µm sieve fractions are chemically different. ^{39}Ar-^{40}Ar stepheating on both sieve fractions of each WM gave hump-shaped age spectra, as expected [1]. The Cl/K-age isotope correlation diagrams prove that in the HT zone in central Naxos two WM generations predominate: one Cl-poor at ca. 38 Ma, one Cl-rich at 20-30 Ma. A lower grade sample from southern Naxos was less pervasively recrystallized, preserves ≥ 3 WM generations; the relict one is > 62 Ma (cf. [3]). The Cl-Si-rich, young WM is enriched in the fine fraction. In the high-grade zone, Rb-Sr ages [2] coincide with K-Ar. Since Ar diffuses $4x10^4$ times faster than Sr [6], K-Ar and Rb-Sr only can agree if both date WM crystallization, and subsequent diffusive Ar loss was negligible as anticipated from the high Ar retentivity of WM [7].

The degassing rates of the fine and coarse WM fractions rule out "multidomain" diffusion (cf. [8]). All HP phengite grains are intergrown with retrograde muscovite at a scale <1 µm [5]. The HP event occurred around 38 Ma.

[1] Contrib. Min. Petr. 93 (1986) 187 - [2] J. Metam. Geol. 35 (2017) 805 - [3] Tectonophys. 745 (2018) 66 - [4] Contrib. Min. Petr. 156 (2008) 27 - [5] Geol. Soc. London Spec. Pub. 378 (2014) 69 - [6] Gondwana Res. 71, 76-90 [7] J. Petrol. 55 (2014) 803 - [8] Contrib. Min. Petr. 167 (2014) 1010