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40Ar/39Ar age determinations in white micas from polymetamorphyc terrains: Constrains on the relevance of the Variscan tectonothermal events in the Cadomian basement of the SW Iberian Massif

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The extent of the Variscan tectonothermal effects in the Cadomian basement of Ossa-Morena Zone (OMZ; southwestern Iberian Massif) is evaluated by 40Ar/39Ar determinations in muscovite concentrates. The Central Zone of OMZ was affected by two Cadomian metamorphic phases dated at ca. 555 Ma (intermediate pressures in amphibolite facies) and ca. 525 Ma (LP-HT migmatization). Subsequent Variscan regional tectonometamorphic overprint in the Central Zone was essentially of low-grade, except in local high-grade cores (e.g., Sierra Albarrana and Aracena) in relation with major shear zones (e.g., the Azuaga fault and the South Iberian Shear Zone). Published 40Ar/39Ar ages in muscovite of the Monesterio area yield a wide range (413–459 Ma) that contrasts with those obtained in the Badajoz-Córdoba shear zone (331–339 Ma). This age spectra has been interpreted as the result of several superimposed tectonometamorphic events. With the aim to evaluate and constrain the age of Variscan deformation in this area, 40Ar/39Ar ratios in muscovite of three samples located progressively further from the Monesterio thrust and in a sample with a significant Variscan high-grade metamorphism from the Hornachos fault have been determined.

Obtained 40Ar/39Ar ages in the three migmatite-leucosome of the Monesterio anatectic core are 423.80±2.00 Ma, 462.62±2.28 Ma, and 472.56±2.32 Ma (from the closest to the farthest sample in reference to the Monesterio thrust, respectively); while in the migmatitic gneiss of the highly deformed (mylonite) rock from the Hornachos fault (sampled at Mina Afortunada dome) is 334.27±1.70 Ma. These ages are comparable with previous radiometric ages. Besides, there is a positive correlation between the 40Ar/39Ar age and the distance from the Monesterio thrust (i.e. tectonic deformation). This appears to have affected intracrystalline argon systems, which had initially cooled through appropriate closure temperatures after initial high-grade Cadomian metamorphism.

Though episodic heating events are ineffective for producing complete 40Ar/39Ar age resetting of large ($\geq$ 1 mm) muscovite crystals in comparison with deformation and reaction mechanisms, preliminary results of this study further emphasize the partitioning of the Variscan tectonothermal metamorphism along the OMZ Cadomian basement. In the case of the three samples of the Monesterio migmatite, the wide range of 40Ar/39Ar ages within compositionally homogeneous grains is consistent with diffusion-dominated argon loss controlled by local deformation. Variscan deformation of this basement was constrained to the reactivation of Cadomian structures, being its effects buffered out of these areas as reflected by the protracted recrystallization history obtained for muscovite concentrates. Finally, the intense deformation of the gneissic mylonite of the Hornachos fault have led to the complete resetting of the 40Ar/39Ar system in muscovite crystals, and we propose the obtained value (334.27±1.70 Ma) as the age of the main Variscan deformation phase in the Central Zone of OMZ.

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