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^{40}AR/^{39}AR DATING OF ECLOGITE-FACIES DEFORMATION IN THE TAUERN WINDOW (EASTERN ALPS, AUSTRIA)

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^{40}Ar/^{39}Ar laser-probe dating and electron microprobe study on bulk-grain white mica from the Eclogite Zone and the Rote Wand – Modereck nappe of the Tauern Window, Eastern Alps (Austria), has been carried out in order to constrain the age of eclogite-facies metamorphism and deformation.

Four concentrates from three samples of eclogite-mylonite show similar chemical composition with an average of c. $Ms_{40}Cel_{51}Pg_9$. ^{40}Ar/^{39}Ar dating of these four concentrates yielded similar flat Ar-release patterns, with ages ranging between 31.9 ± 0.4 Ma and 33.3 ± 0.4 Ma. ^{36}Ar/^{40}Ar vs. ^{39}Ar/^{40}Ar plots yielded isotope correlation ages ranging between 32.0 ± 0.5 Ma and 33.4 ± 0.3 Ma with ^{36}Ar/^{40}Ar intercepts close to atmospheric composition.

One paragonite sample ($Ms_5Pg_{93}Mrg_2$) from a fine-grained eclogite of the same tectonic level yielded a total-gas age of 37.9 ± 2.1 Ma and an isotope correlation age of 40.1 ± 4.2 Ma. The relatively large error of the age results from the low K- and therefore Ar-content of the sample. For comparison, a concentrate of phengitic muscovite ($Ms_{64}Cel_{32}Pg_4$) has been separated from Triassic calcite-marble (sample 5) of the Rote Wand – Modereck nappe, which experienced blueschist-facies metamorphism, followed by a greenschist-facies metamorphic overprint. ^{40}Ar/^{39}Ar dating yielded a total-gas age of 38.9 ± 0.4 Ma, and an isotope correlation age of 38.8 ± 0.3 Ma. Ar-release paterns and ^{36}Ar/^{40}Ar vs. ^{39}Ar/^{40}Ar isotope correlation analyses indicate only negligible influence by incorporation of extraneous ^{40}Ar-components. Both samples are significantly older than the ages obtained from the eclogite-mylonites.

Our results indicate that the Ar-isotopic system in all these white micas have only slightly been influenced by incorporation of extraneous ^{40}Ar-components or ^{40}Ar-loss after initial closure. Therefore, the integrated ages are interpreted to be geologically meaningful, and the age difference of c. 6 Ma between white micas separated from eclogite-mylonites and those from fine-grained eclogite and calcite-marble is interpreted to be significant.

We conclude that in the area of investigation local shear deformation led to the development of high-temperature ductile fabrics, as indicated by the plastic deformation of garnets within the eclogite-mylonites, and subsequent regional cooling below respective closure temperatures for the Ar-isotopic system in white micas at c. 38 Ma. Strain softening localized shear deformation within the eclogite-mylonites and there caused (re-)crystallization of phengites under low-temperatures eclogite-facies metamorphic conditions until c. 32 Ma. This localized deformation caused no disturbance of the previously closed isotopic systems of the phengite and paragonite samples in less deformed rocks. These samples still record older ages, but indicate no presence of extraneous Ar-components.

Furthermore, our study shows that isotope correlation plots significantly help to understand and interpret results obtained by ^{40}Ar/^{39}Ar age dating, and that phengites do not always contain erxtraneous ^{40}Ar-components.

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