



Panafrican $^{39}\text{Ar}/^{40}\text{Ar}$ ages (520-505 Ma) of the tsavorite deposits in the Lelatema Fold Belt (northeastern Tanzania)

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In northeastern Tanzania, three deposits are located within the Lelatema Fold Belt: Merelani, Lemshuku and Namalulu. Tsavorite mineralizations are controlled by two factors: (i) lithostratigraphical as they are always located in metasomatized graphitic gneiss overlain by dolomitic marble; (ii) structural as they only occur in tight isoclinally folded and sheared areas, within 'saddle-reef' structures. P-T conditions for the Merelani gneisses are estimated at 6-6.5 kbar and 610-670°C (Muhongo et al., 1999). Graphitic gneisses are crosscut by concordant tsavorite-bearing quartz veins and gypsum veins. Tsavorite also occurs in metamorphosed nodules concordant to the regional foliation. The strikes of foliation and fault-filled veins are similar indicating that folding, shearing, infilling and deposition of tsavorite, were coeval.

First $^{40}\text{Ar}/^{39}\text{Ar}$ ages from tsavorite deposits of the Lelatema Fold Belt were obtained on single grains of unaltered muscovite, separated by hand picking from mineralized graphitic gneiss from Merelani (sample K MVGG/08), and from unmineralized graphitic gneiss from Lemshuku (sample JF090) and Namalulu (sample JF097). Single grains $^{40}\text{Ar}/^{39}\text{Ar}$ stepwise heating analysis was carried out using a LEXEL 3500 continuous wavelength 6 W argon-ion laser. Reported errors for age calculation are 1σ for plateau and total ages. Spectra exhibit 98% (K MVGG/08), 62% (JF090) and 66% (JF097) of released argon-forming plateau corresponding to clustered ages less than 5% difference. The results give total ages of 511 ± 5 Ma for Merelani, 507 ± 5 Ma for Lemshuku, and 517 ± 5 Ma for Namalulu. These ages are slightly younger than the late convergence event occurred at 550 Ma in the Mahenge area, southeastern Tanzania (Rossetti et al., 2008) and could correspond to shear relaxation.

The age of tsavorite formation can be constrained by dating host-rocks, deformations and formations uprising/cooling. The closest age was obtained on an hydrothermal uraninite from the mineralized Merelani deposit with a Pb-Pb age of ~ 600 Ma (Malisa, 1987). Deformation in northeastern Tanzania has been dated between ~ 640 and ~ 610 Ma by Pb-Pb evaporation on metamorphic zircons from orthogneisses and migmatites from the Lossogonoi and Longido ruby districts (Le Goff et al., 2010). In the tsavorite area of Taita Hills in southeastern Kenya, high-peak metamorphism occurred between ~ 645 -630 Ma according to U-Pb zircon from granulite-facies terranes (Hauzenberger et al., 2007). Cooling is dated at ~ 585 Ma (Sm-Nd garnet-whole rock age) or ~ 560 -570 Ma (Ar/Ar-amphibole age). In the Tsavo Park (Hauzenberger et al., 2004), cooling is comprised between ~ 530 and ~ 550 Ma (Sm-Nd garnet-whole rock age) or ~ 520 Ma (Ar/Ar-amphibole age). The last ages are close to those obtained in northeastern Tanzania, and as the closure temperature of muscovite (around 400°C) is lower than temperature of the metamorphism of graphitic gneiss (~ 600 -620°C), the Ar/Ar-muscovite ages correspond to the rocks cooling during their uprising, and give a

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