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Importance and Implication of Ar-Ar ages of alkaline and ultramafic - lamprophyric dykes from the west coast of India within the Deccan traps

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Eleven samples from 8 alkaline & lamprophyric dykes (and phlogopite [phl], biotite, hornblende [hbl] mineral separates) intruding the Deccan basalt flows along the west coast of India were analyzed by the 40Ar/ 39Ar dating method. Nearly all spectra show moderate to high -discordant step- heating data. Moderate – to well –rounded crystals of phl from lamprophyre (# DMDT-6-00) yielded a plateau age of 77.46±0.13 Ma. The crystallization age for this sample is nearly 12 Ma older than the Deccan basalt flows in which it intrudes. The crystal morphology brings up the question whether the micas were rounded due to magmatic abrasion or due to its assimilation into the melts during its accent through the crust. Two fractions of phl from this dyke yielded ages ranging from 77.5 to 73.4 Ma. Thus different fractions of phl yielded different ages suggesting multiple populations of macrocystic mica extraneous to the primary magma of the dyke. It appears that there are multiple sources of mica within the crust that were assimilated into the magma. Depending on the temperature of the rising magma, the phl should have been reset or at least partially reset, but the data doesn't indicate this. Interestingly, rounded hbl crystals gave an age of 67.38 ± 0.11Ma (heating steps 8-11), while the last heating step yielded an age of 65.59± 0.10 Ma. This age is nearly 6 Ma younger than the youngest phl age. These apparently contrasting ages suggest that phl grains preserve Ar-Ar ages recorded at high temperature in the mantle. Alternatively, argon diffusion in phl may suggest constraining travel times. Whereas, the hbl has crystallized within the dykes with much higher closure temperatures and so have not exchanged Ar from the crust. It appears that lower hbl ages are nearly close to the true ages of these dykes as evidenced from an independent Rb-Sr isochron age of ~ 65 Ma for the same suite of lamprophyre rocks [1]. 65 Ma age imply that the alkaline – ultramafic dyke intrusive phase is nearly synchronous with the bulk Deccan tholeiitic volcanism. Genetic relationship between tholeiitic and alkaline magmatism & depths of magma generation vis-à-vis source regions for the Deccan-RéUnion would be discussed in the talk.

Keywords: Ar-Ar ages, Deccan alkaline magmatism,

References

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