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Evolution of excess argon during shearing event: a case study in the Day Nui Con Voi Metamorphic Complex, Vietnam

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The Day Nui Con Voi (DNCV) Metamorphic Complex along the Red River Shear Zone (RRSZ) in North Vietnam, experiences a long tectonothermal history since the Indosinian orogeny. During the Miocene left-lateral shearing event along the RRSZ, the deeply seated metamorphic rocks exhumed and cooled rapidly. The present study demonstrates a combination of SEM, EDS and $^{40}Ar/^{39}Ar$ laserprobe analyses on biotite inclusions, alteration and neocrystalline phases in garnet porphyroblasts, to reveal the evolution of excess argon during the Miocene thermal event. The biotite inclusions exhibit inverse isochron age at 24Ma, which is consistent with the ages of fabrics biotites. Whereas, the muscovite and chlorite mixture located at the rim of biotite inclusion show a large variation in apparent $^{40}Ar/^{39}Ar$ ages from 24 to 2600 Ma with high$^{40}Ar/^{36}Ar$ initial ratios. Similar age pattern and ratios can also be found in the newly grown muscovite and chlorite mixtures in the fractures adjacent to the biotite inclusions. The good correlation of excess argon with $^{38}Ar_{Cl}$ further suggests that excess argonwas mainly uptake by chlorite. These features confirm the previous result that low-K phases usually have high solubility of excess argon, and also indicate that argon released from biotite inclusions can potentially be trapped in the newly grown secondary phases along the fracture during metamorphism.