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^{40}Ar/^{39}Ar UV laserprobe dating of inclusion and matrix biotites: possible insights into the prograde evolution of garnet

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^{40}Ar / ^{39}Ar UV laserprobe dating of both inclusion and matrix biotites within low-P granulite facies hornfels from the inner metamorphic aureole of the (c.470 Ma) Belhelvie gabbro intrusion, Aberdeenshire, Scotland yields information on their metamorphic evolution.

Biotite inclusions within three garnet porphyroblasts, from separate samples, formed during contact metamorphism yield ^{40}Ar / ^{39}Ar occlusion ages of $\sim$ 466 $\pm$ 5, 404 $\pm$ 3 and 426 $\pm$ 8 Ma. Although careful petrography isolates inclusions that should retain radiogenic argon, results suggest that some populations may have lost radiogenic argon by diffusion, producing a younger age than anticipated. However, those showing contemporary ages (466 $\pm$ 5Ma) with published U-Pb zircon ages of the intrusion suite show the highest levels of gas extraction during analysis, and thereby the most reliable data. These results provide insight into the timing of prograde garnet formation associated with contact metamorphism.

Matrix biotites consistently yield ^{40}Ar / ^{39}Ar cooling ages of 438 $\pm$ 6 Ma, indicating the rocks of the Buchan terrane had cooled to c.300 ^{o}C by the early Llandovery.

Our results show that, in ideal circumstances, prograde metamorphic ages may be recovered from biotite inclusion populations in garnet porphyroblasts.