Cosmogenic helium and neon in 11 Myr old ultramafic xenoliths: Consequences for mantle signatures in old samples

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The helium and neon isotopic compositions of olivines coming from a 11 Myr old xenolith sampled at Mt. Hampton (West Antarctica) were analyzed by crushing. The helium isotopic ratio varies between 1340 and 6300 (R/Ra between 115 and 539) with 4He content around 3–8 10−10 ccSTP/g, confirming that cosmogenic helium can be extracted by crushing. The neon also shows a clear cosmogenic origin (20Ne/22Ne down to 7.7 and 21Ne/22Ne > 0.32), indicating that the cosmogenic neon can also be extracted by crushing out of the olivines. Melting of the powder left after the crushing experiment gives a 4He/3He ratio as low as 42 ± 8 (R/Ra = 17,300) and 21Ne/22Ne as high as 0.78, close to the cosmogenic production end‐member. This study shows that up to ∼0.5% of cosmogenic helium and neon can be extracted by crushing. In this way, for samples that had been exposed to cosmic rays for a long time (e.g., a few Myr), a crushing procedure may not give the mantle ratios without ambiguity, and measurement of neon can help to discriminate between cosmogenic and mantle origin of the 3He.

**Citation:** Moreira, M. and P. Madureira (2005), Cosmogenic helium and neon in 11 Myr old ultramafic xenoliths: Consequences for mantle signatures in old samples, *Geochem. Geophys. Geosyst.*, 6, Q08006, doi:10.1029/2005GC000939.