



Radiometric Dating of Bioalteration Textures in Archean Basaltic Metaglasses

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Direct *in-situ* U-Pb dating of titanite which infills tubular bioalteration textures in pillow basalt rims from the ~ 3.35 Ga Euro basalt of the Pilbara craton, W. Australia (PWA) confirms their Archean age [1]. A novel *in situ* laser ablation multi-collector-ICP-MS technique is here reported that has enabled the first radiometric age determination of an Archean biosignature.

Multiple lines of evidence suggest that these tubular bioalteration textures formed by microbial etching of formerly glassy Archean lavas that were subsequently mineralized by titanite. Firstly, there are striking morphological similarities between tubular structures from both the Pilbara and Barberton (BGB) cratons and bioalteration textures in modern glasses. Secondly, X-ray mapping indicates C enriched along the margins of the tubular structures from both the BGB and PWA. Thirdly, disseminated carbonates in the BGB pillow rims have C-isotopes depleted by as much as -16% , which is consistent with microbial oxidation of organic matter.

A pre-metamorphic age for these microtubes is indicated by their segmentation caused by metamorphic chlorite overgrowths. A laser ablation spot size of $\sim 40\mu\text{m}$ was used to analyze titanite in the "root zones" at the centre of microtube clusters. Thirteen analyzes upon three thin sections gave a weighted average $^{206}\text{Pb}/^{238}\text{U}$ age of 2921 ± 110 Ma [1]. This corresponds to the oldest metamorphic episode that has affected the PWA rocks and gives a minimum, late Archean age estimate for the bioalteration.

[1] Banerjee et al. Direct dating of Archean microbial ichnofossils. *Geology in press*.