Trace-element analysis of quartz in the Jack Hills metaconglomerate

M. R. ACKERSON[1]*, N. D. TAILBY[1] AND E. B. WATSON[1]

[1]Dept. of Earth and Environmental Sciences, Rensselaer Polytechnic Institute, Troy, NY 12180, USA (*correspondence: ackerm3@rpi.edu)

The trace-element chemistry of Hadean zircons from the Jack Hills metaconglomerate (Eranondoo Hill, W74 site) has broadened our understanding of the early earth. Despite the importance of these samples, little work has been done on the chemistry and history of W74 quartz, which dominates the mineral assemblage[1]. Advances in TitaniQ thermometry[2] and quartz trace-element chemistry provide insights into the origin and history of quartz in the metaconglomerate. In this study we present chemical and petrographic evidence that quartz of the Jack Hills metaconglomerate has undergone pervasive recrystallization since deposition. We observe no chemical or petrographic evidence for primary magmatic quartz.

Quartz dominates both pebbles and matrix at W74, both of which show evidence of dynamic recrystallization and grain boundary migration. The unit is also cut by post-depositional quartz veins, which are undeformed.

LA-ICPMS analyses of matrix quartz and >40 individual pebbles demonstrate uniformly low Ti content. Ti-in-quartz thermometry[2] (assuming a_{TiO2} = 1 and P~4 kbar) yields an average pebble quartz temperature of 346 °C and an average matrix quartz temperature of 401 °C. Post-depositional quartz veins record a temperature of 344 °C. These temperature estimates conform with accessory mineral observations of regional greenschist-grade metamorphism. Low abundances of other trace elements in the quartz (Al, K, Li, Na, Fe) compared to quartz from granitic and high-grade metamorphic systems support the notion that the majority of quartz has undergone pervasive post-depositional recrystallization at greenschist facies conditions.

[1]Menneken *et al* (2001) *MinMag* **75**, 1455 [2] Thomas *et al* (2010) *Contrib Mineral Petrol* **160**, 743-759