

Pb nanospheres in Hadean and Eoarchean zircon at Jack Hills

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Hadean and Archean zircons from Jack Hills in the Yilgarn Craton of Western Australia record micro- and nanometre variations in Pb. Radiogenic lead (Pb*) atoms were originally considered to be located in the zircon structure [1]. However, it was established that Pb* formed nanoclusters, with localized concentrations likely resulting from a later thermal event affecting radiation damaged zircon [2]. A further study on zircon from the W74 site recorded a concordant ²⁰⁷Pb/²⁰⁶Pb age of 4463 Ma, which was, however, spurious because of Pb* clustering [3]. We have utilized TEM to analyse zircons from the W74 site with a range of U, $\delta^{18}\text{O}$ and OH contents, and variable discordance. We discovered that Pb nanospheres are also present in Jack Hills zircon and are present irrespective of geochronological concordance, and are not correlated with U, Th, $\delta^{18}\text{O}$ and OH contents [5]. Furthermore, they show no evidence of UHT conditions, which is significantly different from the UHT rocks in Enderby Land, Antarctica [6] and Kerala in India [7] where nanospheres in zircons were previously discovered.

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[1] Utsunomiya *et al.*, 2004 *GCA* **68**, 4679-4686. [2] Valley *et al.*, 2014 *Nat Geosci* **7**, 219-223. [3] Ge *et al.*, 2018. *Geology*, **46**, 303-306. [4] Pidgeon *et al.*, 2017 *GCA* **197**, 142-166. [5] Kusiak *et al.*, 2023 *Sci Rep* **13**, 895. [6] Kusiak *et al.*, 2015 *PNAS* **112**, 4958-4963. [7] Whitehouse *et al.*, 2017, *Miner Petrol* **111**, 467-474.