Sieve textures in impact zircon from Vredefort, South Africa: Implications to impact geochronology

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The bombardment history of our planet has major implications for Earth's atmosphere, habitability, near surface conditions, and the delivery of the building blocks of life over its four and a half billion years. Constraining the impact flux to the Earth-Moon system was highlighted by the National Research Council's 2007 report "The Scientific Context for the Exploration of the Moon" as the top priority goal for lunar research. Evidence of the early impact flux has largely been based on interpretations of ^{40}Ar-^{39}Ar ages of lunar samples which can be problematic due to the presence of relic clasts, incomplete Ar outgassing, diffusive modification during shock and heating, and exposure to solar wind and cosmic rays [1]. Recent studies [2,3] have utilized zircon from Apollo samples as well as lunar meteorites to better constrain the impact history of the Moon. Sieve textures found in zircon within lunar meteorite SaU 169 have been identified as "poikilitic impact melt zircon formed during equilibrium crystallization of the impact melt" and used to better constain the age of the Ibrium impact [3]. Such textures had previously not been observed in terrestrial zircon. We report the first terrestrial sieve textures in zircon isolated from Vredefort impactites. Zircons isolated from the granophyre unit show a intimate relationship with pyroxene, similar to that seen in the lunar samples, most likely due to resorption. U-Pb analysis of such grains clearly shows that the zircons have been inherited from the target and are not neo-formed zircon that crystallized from the impact melt and thus should not be used to imply impact events. Pb-loss is highly variable in these samples and the lower intercept age of ~1985±150 Ma agrees well with that of the Vredefort impact [4,5]. Zircon geochronology offers a new tool with which to constrain planetary impact histories however effects on zircon from impact events remain poorly understood and need to be explored terrestrially prior to making interpretations on extraterrestrial samples.

[1] Fernandes *et al.* (2013) *MAPS* **48**, 241-269. [2] Nemchin *et al.* (2008) *GCA* **72**, 668-689. [3] Liu *et al.* (2013) *EPSL* 319-320, 277-286. [4] Kamo *et al.* (1996) *EPSL* **144**, 369-387. [5] Wielicki *et al.* (2012) *EPSL* **321-322**, 20-31

Modeling nanomaterial transport and biouptake in a complex aquatic system: Exploring surface affinity as a predictor of nanoparticle fate

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A recent study of silver nanoparticles introduced to a simulated freshwater wetland indicated an initial period of particle removal and associated die-off of some aquatic plants. This talk considers the initial transport and fate of nanoparticles introduced to this system from the standpoint of heteroaggregation, deposition, and dissolution and the implications for short-term impacts on rooted aquatic plants. Simulations show that nanoparticles introduced in a complex, albeit greatly simplified environment exhibit a wide range of behaviors depending on their affinities for each other and their concentrations. The complexity of these interactions appears to be governed by the relative affinity of nanoparticles for each other (autoaggregation) and with background particles (heteroaggregation) and other native surfaces. Surface affinity as a predictor or nanoparticle fate is explored further in the context of interactions with plant surfaces biofilms and the potential for uptake by plants. A functional assay for determining the affinity of nanoparticles for complex mixtures of native particles is evaluated.

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