

Sodium in foraminiferal calcite

ELIZABETH READ^{1*}, OSCAR BRANSON², TOLEK TYLISZCZAK³, SIMON REDFERN¹

¹Department of Earth Sciences, Downing Street, Cambridge, CB2 3EQ, UK

*Correspondence to er368@cam.ac.uk

²Research School of Earth Sciences, Building 142 Mills Road, Acton ACT, 2601 Australia

³1 Cyclotron Road, Berkley, CA 94720

The Na/Ca of foraminifera has been suggested as a proxy for past ocean salinity [1], but the mode of Na incorporation into foraminiferal calcite is poorly constrained. Studies of Na in foraminifera have suggested both that Na is intervalently hosted in the mineral structure [2], or predominantly present within intra-skeletal organic layers [3]. We present a sub-micron-scale study of the distribution and chemical state of Na in *Amphistegina lessonii* using scanning transmission X-ray microscopy (STXM). We compare the distribution of Na relative to Mg and B in the same specimen, and interpret these patterns in context of biomineralisation processes. The chemical state of Na in foraminifera is not matched by any mineral standard, and instead is most like organic-hosted Na. These data suggest that Na is predominantly present within organic layers in foraminifera. This must be considered if the Na/Ca salinity proxy is to be developed for palaeosalinity reconstructions, due to the unknown preservation of trace element signals in organic matter in marine sediments throughout time.

[1] Wit *et al.* (2013) *Biogeosciences* **10** pp 6375-6387

[2] Yoshimura *et al.* (2017) *Geochim. Cosmochim. Acta* **202** pp 21-38

[3] Branson *et al.* (2016) *PNAS* **113** pp 12934-12939