

# Early diagenetic processes within ooids: Implications for the interpretation of carbonate associated sulphate and nitrate

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Ooids are spherical grains coated by layers of calcite or aragonite crystals which are cemented together to form sedimentary rocks and are common in the geological record. Although the processes where by ooids actually form is still speculative, the geochemistry has been used to interpret aspect of the ocean chemistry during which the ooids formed. For example, parameters such as carbonate associated sulphate (CAS) or nitrate (CAN) have been proposed to reflect oceanic values at the time of formation. Recent work using genetic markers [1] has determined that ooids contain both sulphate reducing and denitrifying bacteria. These bacteria contribute towards the maturation of the ooid. In order to investigate the implications upon the CAS and CAN, we leached crushed and cleaned ooids in DIW and analysed the leachate for the  $\delta^{15}\text{N}$  and  $\delta^{18}\text{O}$  of the nitrate and  $\delta^{34}\text{S}$  of the sulphate. We also analysed the water for alkalinity, pH,  $\delta^{13}\text{C}$  of the dissolved inorganic carbon and major and minor element geochemistry. These analyses revealed not only positive  $\delta^{15}\text{N}$  and  $\delta^{18}\text{O}$  values, signatures of denitrification but also negative  $\delta^{34}\text{S}$  values suggesting the oxidation of  $\text{H}_2\text{S}$ . Elemental analyses of the leachate suggested the phases might be contained in amorphous calcium carbonate (ACC) with a high Mg content. Clearly microbial processes are taking place within the ooid contributing geochemical signature.

[1] Diaz, M.R., Van Norstrand, J.D., Eberli, G.P., Piggot, A.M., Zhou, J. and Klaus, J.S. (2014) *Geobiology*, **12**, 231-249.