

Sedimentary organic C/P ratios as a redox proxy in long-term records for the Mediterranean Sea

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Ratios of organic carbon to phosphorus (Corg/P) in marine sediments are known to reflect the influence of benthic redox conditions on phosphorus and carbon regeneration. This makes Corg/P ratios a potentially powerful indicator for bottom water redox conditions and ultimately for atmospheric O₂ [1]. Caution is required, however, since the primary signals may be obscured by post-depositional alteration. For example, Corg/P ratios in the most recent eastern Mediterranean sapropel S1 were found to decrease dramatically from values of ca. 300 to values far below the Redfield ratio upon post-depositional oxidation with downward diffusing oxygen [2]. Exceptionally high Corg/P ratios in Pliocene and Cretaceous anoxic sediments [3, 4] when compared to modern sediments suggest that long-term diagenesis under anoxia may lead to a loss of sediment P relative to C. As yet, little information is available on possible changes of Corg/P ratios in oxic and anoxic sediments during long-term burial.

Here, we present detailed sediment data for two long cores (KC01 and KC19) from the eastern Mediterranean that contain a repetitive alternation of organic-poor and organic-rich sediments (sapropels) which were deposited under oxic and anoxic conditions, respectively. Our results show that low Corg/P ratios are preserved in oxic sediments despite long-term burial. Various proxies indicate that the extent of anoxia must have varied between different sapropels. Sedimentary Corg/P ratios are in accordance with these trends in relative anoxia showing that, for preserved sapropels, these ratios are also a good indicator of bottom water redox conditions in the Mediterranean. We find no evidence for diagenetic loss of P relative to Corg during long-term burial under anoxic conditions over a period of up to 500 kyrs.

[1] Algeo, T.J. & E.D. Ingall (2007) *Palaeogeogr. Palaeoclimatol. Palaeoecol.* **256**, 130–155. [2] Slomp, C.P. *et al.* 2002. *Geochim. Cosmochim. Acta* **66**, 1171–1184. [3] Slomp, C.P. & P. Van Cappellen (2007) *Biogeosciences* **4**, 155–171. [4] Mort, H. *et al.* (2007) *Geology* **35**, 483–486.

The microbial weathering of lead jarosite

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Plumbojarosite (PbFe₆(SO₄)₄(OH)₁₂) is often associated with lead based sulfide deposits. The precipitation of jarosite has been used extensively in the metallurgical industry to scavenge iron, alkali metals and sulfate ions during base metal processing [1]. As a result large volumes of jarosite waste is produced and confined to large repositories such as tailings impoundments. To date there have been few studies which have investigated the effects of microbial metal reduction on the solubility of jarosite minerals in particular, an emphasis on metal behaviour in these reduced anoxic environments.

Previous investigations using silver jarosite (Fig. 1) show preferential Ag sorption on the bacteria. Hence progressive nucleation of silver within the cell wall leads to a degree of cytotoxicity to the bacteria [2].

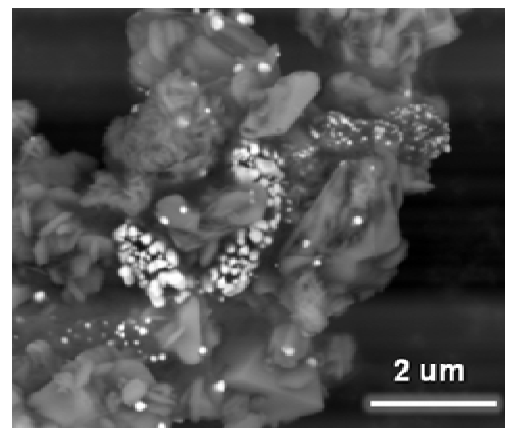


Figure 1: Secondary mineralization associated with microbial biomass.

Here we investigate the effects of dissimilatory metal reducing bacteria (*Shewanella putrefaciens* CN32) on the solubility of plumbojarosite. The mechanisms and stability will be discussed.

[1] Dutrizac & Jambor (2000) *Reviews in Min & Geochem* **40**, 405–452. [2] Weisener (2008, in press).