

Mineralogical and geochemical characteristics of micro-mineral particles in the South Pacific Gyre sediment (IODP Exp. 329)

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Ferromanganese minerals widely occur on the seafloor of abyssal plains as nodules consisting of manganese, iron and various trace metal elements. Accumulation and dissolution of the vast mineral deposits play important roles in the global element cycle. However, no clear picture has yet emerged as to the nature of these mineral deposits in deep subseafloor oxic sediments. During the Integrated Ocean Drilling Program (IODP) Expedition 329, we drilled the entire sedimentary sequence at 6 sites in the ultra-oligotrophic region of the South Pacific Gyre (SPG), where dissolved O₂ and aerobic microbial communities are present from the seafloor to the sediment-basement interface [1]. We observed abundant micrometer-scale particles of ferromanganese minerals (Mn-microparticles) in oxic pelagic clay sediments of the SPG over 100 million years. Three-dimensional micro-texture and elemental composition analyses using mass-spectrometric, flow cytometry and synchrotron-based approaches revealed that most Mn-microparticles are poorly crystalline ferromanganese minerals that consist of various trace metals and carbon species, indicating that Mn-microparticles are possibly derived from the past hydrothermal activity and widespread buried in the open-ocean gyre.

[1] D' Hondt et al., Presence of oxygen and aerobic communities from seafloor to basement in deep-sea sediment. *Nature Geosciences*, 8(4), 299-304, 2015.

Keywords: micro-mineral particle, pelagic clay, South Pacific Gyre