Dissolved iron in the vicinity of the Kerguelen Islands, Southern Ocean, during the KEOPS 2 experiment

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During KEOPS 2 (KErguelen Ocean and Plateau compared Study 2, Oct.-Nov. 2011), the distribution of dissolved Fe was investigated in the upper 1300 m in the vicinity of the Kerguelen Islands. Samples were analysed on board by flow injection analysis and chemiluminescence detection, with a detection limit of 0.02 ± 0.02 nM (n=13). A clear enrichment was observed above the Plateau. Indeed, the highest concentrations (2-4 nM) were observed at the most coastal station, east of the Kerguelen Islands. Then concentrations decreased eastward with the lowest values in an anti-cyclonic structure (0.06 nM at sea-surface and 0.3-0.4 nM at depth). A similar behaviour was observed at our reference station in the HNLC area, west of the Kerguelen Islands. In the polar front region, concentrations increased with values around 0.3-0.4 nM at sea-surface and 0.6-0.7 nM at depth. On-board incubations on natural plankton communities clearly showed a strong iron limitation at our reference station, a moderate one in the anti-cyclonic structure and no limitation above the Plateau.

Sorption of borate on calcined products of natural dolomite

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Introduction

Boron is a dynamic trace element that can affect the metabolism or utilization of numerous substances involved in life processes, and also one of the most difficult elements to immobilize in aquatic environments [1]. Natural dolomite was modified to provide as a sorbent for borate. Calcination condition was investigated at 700 °C ~900 °C under air and reducing atmosphere.

Results and Conclusion

Calcite ($CaCO_3$) and magnesian calcite (Ca, Mg)CO_3 were included as impurities as well as dolomite ($CaMg(CO_3)_2$) in the specimen. Increasing with calcination temperature, sequential decarbonation was confirmed by XRD, that is, transformation of dolomite into magnesia and calcite at 700 °C, transformation of magnesian carbonate into magnesia and calcite at 800 °C, and transformation of calcite into lime at 900 °C. Surface molar ratio of Ca/Mg decreased from 1.6 to 0.6 independently of calcination temperatures. Sorption isotherm of borate at 25 °C was compared with calcined products under different conditions. In calcination under air, the greatest sorption density of borate was found with calcined product at 700 °C (Fig. 1). BET type of sorption isothedrm curve suggests that removal of borate is expected to occur through destructive sorption of MgO in calcined products. However, under reducing conditions the greatest sorption density was observed with calcined product at 900 °C.

Removal mechanism of borate is principally co-precipitation with $Mg(OH)_2$ in hydration nof MgO. The above result suggests the surface of magnesia (MgO) was more significantly affected by CO_2 in a process of decarbonation at higher temperature, and that higher crystalinity of MgO is more reactive in hydration.

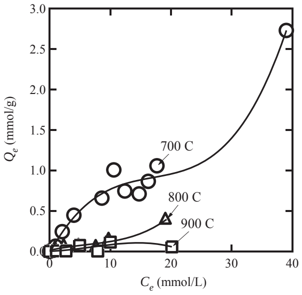

Figure 1: Sorption isotherm of borate at 25 °C on calcined products of natural dolomite at 700 °C ~900 °C under air.

[1] Sasaki *et al.* (2011) *J. Hazard. Mater.*, **185,** 1440-1447.