Distribution of neodymium isotopes in Eastern Equatorial Pacific seawater

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The Rare Earth Element (REE) neodymium (Nd) is introduced into seawater through continental weathering and exchange with the continental shelves. Due to its intermediate oceanic residence time and the fact that it is independent of biological fractionation it is a powerful chemical water mass proxy and can also be applied for the reconstruction of past ocean circulation. For its reliable use a precise knowledge of the present-day distribution and input mechanisms is required. Over the last years, a large number of Nd isotope data have been produced for Atlantic seawater but only very few data are available for the Pacific Ocean.

In this study we present the first dissolved Nd isotope data for the Eastern Equatorial Pacific (EEP), where one of the globally largest Oxygen Minimum Zones (OMZ) is located. Samples were recovered along several zonal and meridional sections during "FS Meteor" cruises M77/3 and M77/4 in 2009. Surface waters in the study area show a wide isotopic range (ε_{Nd}= -8 to ε_{Nd}= +3), due to contributions from land accompanied by leaching of particles and shelf sediments. Near surface circulation in the EEP is controlled by the complex Peru-Chile Current System and intense coastal upwelling. These water masses originate from the western and central Pacific, such as the Equatorial Undercurrent, which is the main feeder of the Peruvian Upwelling. This current, which enters the system near the equator is characterized by highly radiogenic isotope values (ε_{Nd}= -1.8), significantly different from less radiogenic subsurface currents stemming from the south, as well as from central and northern Pacific areas (ε_{Nd}= -4). Deep and bottom waters at the southernmost stations (14°S) of the study area (ε_{Nd}= -7) are clearly influenced by less radiogenic water masses originating from the Southern Ocean. Towards the equator, the bottom waters show a trend towards more radiogenic values (ε_{Nd}= -2). In addition, the REE patterns of the same seawater samples were analyzed to better understand the input mechanisms (potential release from reducing sediments within the OMZ) and vertical exchange processes (biological productivity) in this highly dynamic system.

Formation of nanoparticles with stereochemical effects using the polyphenol-pseudoboehmite complexation

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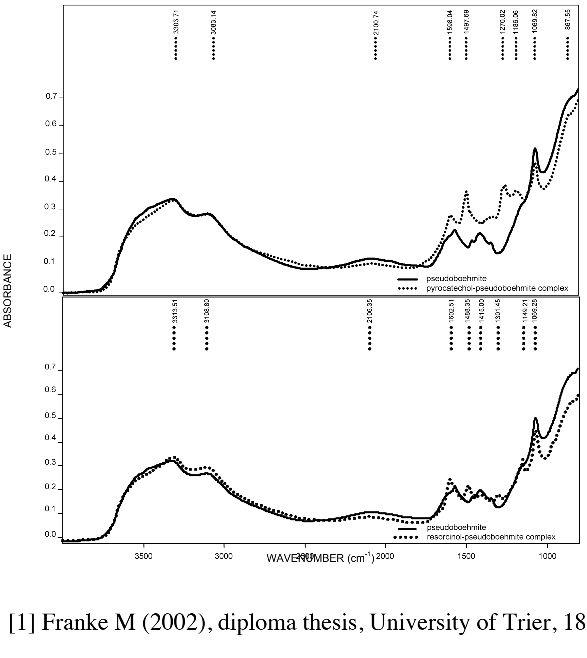
Stereochemical effects were observed by the formation of organominerally nanoparticles using the system of polyphenol-pseudoboehmite. In this study, four types of phenolic compound, being pyrocatechol, resorcin, pyrogallol and guaiacol, were used for the preparation of four types of organomineral complexes. The complexes were synthesized by adsorption in a gas-solid phase at 50 °C in the presence of atmospheric pressure for a period of 60 days in total darkness. Subsequently, a comparative structure analysis was conducted from pseudoboehmite and polyphenol-pseudoboehmite complexes by using methods of VNIR spectroradiometry and Fourier transform infrared (FTIR) spectrometry. The complexation took place at surface level between OH atoms of pseudoboehmite and the functional groups of polyphenol due to the elimination of H_2O. However, the growth of nanoparticles was dependent on stereochemical effects, based on the constitution, configuration and conformation of molecules.



[1] Franke M (2002), diploma thesis, University of Trier, 187.