Cerium anomaly as the indicator of phase transformations of Fe-Mn authigenous minerals in the ocean

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It is well known, that Fe-Mn oxyhydroxides (nodules (N) and micronodules (MN)) in the ocean accumulate rare earth elements (REE). Cerium, which is oxidized in the upper part of oceanic water column, forms positive cerium anomaly (Ce an) on the suspended Fe-Mn oxyhydroxides. In identical conditions of sedimentary flux the N and MN differ on Mn/Fe ratio which reflects the higher mobility of Mn relative to Fe in suboxic diagenesis in pelagic deposits (see fig.). Trivalent REE strongly correlate with Fe oxyhydroxides. The accumulation of Ce is defined by its oxidation together with Mn in the water column. In diagenesis Ce is reduced together with Mn. However, the mobility of the reduced Ce(III) is much lower than Mn(II) and is comparable with Pr and La. Mobility of Ce(IV) in diagenesis is very low and close to Th. So, the release of reduced cerium in pore water will be no more than neighbor REE and the Ce an will be not varied. However Ce an in micronodules is regularly higher, than in nodules from bioproductive zones of Pacific ocean (see fig.). The reason of relatively high Ce an in MN is result of phase transformations of Fe oxyhydroxides during diagenesis after Mn reduction. Iron oxyhydroxides adsorb the phosphate-ions from bottom waters with Ce deficit (P/Fe value grows) that in turn lead to additional sorbtion of trivalent REE on phosphatic surfaces.

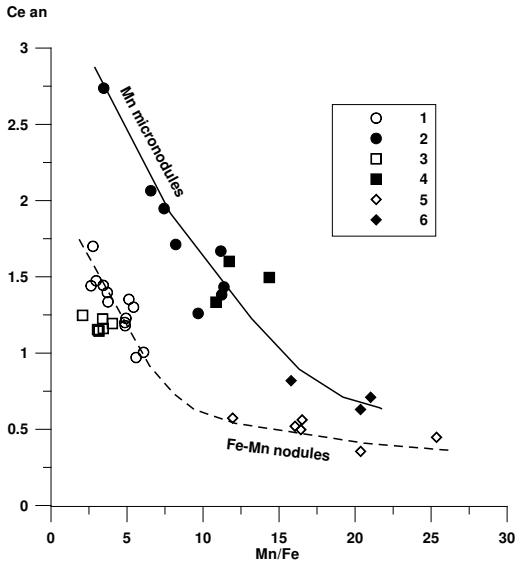

Figure. Ce an vs Mn/Fe ratio in N and MN from North Equatorial Pacific (1,2), Peru Basin (3,4) and Guatemala Deep (5,6).