

A lead isotopic study on the bedded manganese deposits of Neogene

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Many bedded manganese deposits occur in the Neogene sedimentary rocks in the Green Tuff region, Northeast Japan. In order to understand the origin of lead in these deposits, lead isotopes are analyzed for the 38 ore samples of bedded manganese deposits from southwestern Hokkaido to Izu, and for 3 manganese oxides vein samples from Izu.

The $^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$, and $^{208}\text{Pb}/^{204}\text{Pb}$ of the bedded manganese ores are quite homogeneous throughout the region, ranging in 18.38-18.54, 15.52-15.62, and 38.23-38.61, respectively. They are distinguishable in the compositions from the manganese oxides vein samples with 18.19-18.22, 15.48-15.50 and 38.00-38.06, respectively.

The leads of the bedded manganese ores have lower radiogenic isotopes than those of modern Pacific manganese crusts, and are plotted in the region of volcanic rocks in the island arcs and continental arcs in the $^{206}\text{Pb}/^{204}\text{Pb}$ - $^{208}\text{Pb}/^{204}\text{Pb}$ and $^{206}\text{Pb}/^{204}\text{Pb}$ - $^{207}\text{Pb}/^{204}\text{Pb}$ diagrams. The isotopic compositions are different from those of modern hydrothermal vent ores, but are identical to those of contemporaneous Kuroko deposits. This striking similarity in the lead isotope compositions between the bedded manganese ores and the Kuroko ores can be explained by a hydrothermal model in which the submarine hydrothermal activity formed the Kuroko deposits around hydrothermal vents and also formed bedded manganese deposits in the oxic environment far from the vents via hydrothermal plume.