HOST PHASES OF TRACE ELEMENTS IN FERROMANGANESE CRUSTS FROM THE WESTERN ARCTIC OCEAN BASED ON SEQUENTIAL LEACHING

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Ferromanganese crusts (Fe-Mn crusts) from the Amerasia part of Arctic Ocean are charactarized by a unique chemical composition with high Fe/Mn and low Si/Al ratios and high contents of some trace elemets such as As, Hg, Li, Sc, Th, and V [1, 2]. Based on the SEM-EDS data, Fe-Mn crusts consist of three main phases: Mn oxides, Fe hydroxides, and aluminosilicate detrital minerals. Element correlations are not definitive as to the main Fe-Mn crust phases with which elements are associated. Thus, microprobe analyses show that Sc occurs in most mineral types, including Mn oxides, amorphous Fe hydroxides, and detrital minerals.

Sequential leaching experiments were carried out on 15 Fe-Mn crust samples from different parts of Mendeleev Ridge [1] and Chuckchi Boderland [2] to determine temporal variations in main phase compositions based on analyses of three stratigraphic layers in the crusts, and spatially in the western Arctic Ocean. The analytical technique is after Koschinsky and Halbach [3]. The layers and bulk samples were sequentially leached into four fractions: (1) Easily leachable fraction (acetic acid buffer) released exchangable cations and dissolved Ca carbonates; (2) Easily reducible fraction (hydroxylamine hydrochloride) dissolved the Mn oxides; (3) Moderately reducible fraction (oxalic acid buffer) dissolved amorphous Fe oxyhydroxides; and (4) Residual fraction (total digestion) leached the crystalline detrital phases (well crystalline oxides, silica, aluminosilicates) [3]. Different minor and trace elements were leached with each major phase and will be compared with Fe-Mn crusts from other parts of the global ocean. Unique element associations in the Arctic crusts reflect the unique characteristics of the Arctic Ocean [2].

[1] Konstantinova, N., Cherkashov, G., Hein, J.R., et al. 2016. Ore Geology Reviews, published online 10/2016. [2] Hein, J.R., Konstantinova, N., Mikesell, M., et al. (submitted) [3] Koschinsky, A. and Halbach, P., 1995. Geochimica et Cosmochimica Acta 59, 5113-5132.