

Formation mechanism of water chemistry in relation to the environments – Laboratory experiments for undergraduate students-

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A series of laboratory experiments are constructed to 1) learn basic analytical techniques and those principles and 2) to understand the formation mechanisms of water chemistry through water-rock interaction and anthropogenic pollution. The contents of experiments are as follows: 1) DO at different temperatures; 2) activity of dissolved ions estimated by EC (electric conductivity); 3) Major element analyses of natural riverwaters (major anions and cations, dissolved silica) and charge valance; 4) Chemical weathering process to dissolve major cations, silica and REEs simulated by the water-rock interaction experiment; 5) Saturation index calculation of carbonates and silica of analyzed riverwaters; 6) Cation exchange reaction between clays and waters; 7) Anthropogenic inputs of pollutant into hydrosphere.

In the course of experiments, very basic analytical procedures for titration, colorimetry, and physical analyses including ion-chromatography, atomic adsorption photometry, mass-spectroscopy, etc. were experienced. Throughout the analyses, basic knowlegements on the principles of chemical and physical analytical techniques were also explained.

For the water analyses, the waters were taken from Yamato River, which is one of most polluted rivers of Japan (although the water quality is not seriously bad at present). Water-rock interaction experiment tells the importance of basement flow onto the water chemistry of riverwater in the upstream. However, anthropogenic activities affect on the water quality, especially sulfate and nitrate ions and COD in the downstream. The river is running just adjacent to the campus, and the students have easily interests on the environmental problems surrounding their own lives. Dissolution reaction of various rocks with diluted acid is useful to understand the chemical weathering to supply metal ions not only major soluble cations but also REEs into the hydrosphere. When the all data set is summarized in the final report, processes of water-rock interaction and importance of water as transportation system of materials in the hydrosphere can be understood.