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Oxidation-reduction condition of aquifer at geo-pollution site and change of VOCs concentration on Shimousa upland, northern Boso Peninsula, central Japan

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Groundwater quality was evaluated at monitoring wells on some aquifers at a site polluted with Benzene, Xylene, Toluene, 1,2-Dichloroethane (EDC), Dichloromethane (DCM), Tetrachloroethylene (PCE), 1,2-Dichloroethylene (1,2-DCE) and Trichloroethylene (TCE) in central Shimousa upland, northern Boso Peninsula, southeast Japan. This site is composed of one perched aquifer, one perched aquitard, three aquifers, two aquiclude and one aquitard within about 50m depth. The third aquifer is composed of medium-fine sand with reduction groundwater; second is composed of medium-fine sand with oxidation groundwater; and the first aquifer is generally composed of mainly fine sand with oxidation groundwater. Perched aquitard, Jyoso mud covers the 1st aquifer. Perched aquifer, Kanto loam formation which consists of weathered ash, covers the perched aquitard.

Vertical change of groundwater qualities were observed by portable submerged water quality measurements at the monitoring wells of the first aquifer in October 2010 [1] and October 2015 [2]. Groundwater qualities of the first aquifer are: oxidation, +130 - +350 mV (ORP), 3 - 7 mg/l (DO), 15 - 35 mS/m (EC) and pH 6.0 - 6.5. Groundwater qualities of down flow side of groundwater from polluted source are: reduction, -150 - -320 mV (ORP), 0.00 mg/l (DO), 90 - 140 mS/m (EC) and pH 6.4 - 6.5. Strong reduction condition has been observed on the down flow side of groundwater from polluted source. Concentration of PCE decreases near polluted source and concentration of 1,2-DCE and vinyl chloride increase at down flow side of groundwater. The above facts may suggest the existence of reduction bacteria for PCE which is active in a strong reducing condition.

References:

[1] Kazaoka, O., Suzuki, E., Takakura, A., Fujigasaki, M., Yoshida, T., Sakai, Y., Kusuda, T. and Yamamoto, M. (2010) In: *The proceedings of the 20th Symposium on Geo-Environments and Geo-Technics*, Japan Society of Geo-pollution Science, Medical Geology and Urban geology, 99-104.

[2] Honda, E., Kazaoka, O., Fujigasaki, M., Naganeyama, K., Yoshida, T., Watanabe, A., Nakamaru, J., Tezuka, Y. and Mukai, S. (2015) In: *The proceedings of the 25th Symposium on Geo-Environments and Geo-Technics*, Japan Society of Geo-pollution Science, Medical Geology and Urban geology, 69-72.

