

Heavy metal removal from the groundwater by using soil bacterium, *Ralstonia* sp. and *Bacillus* sp.

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Lab scale biosorption experiments were performed to remove heavy metals from contaminated groundwater. For the experiment, 2 species of *Ralstonia* sp. and *Bacillus* sp. were used as biosorbents, which were isolated from the oil contaminated sites, Korea. Artificially contaminated groundwater with heavy metals and the genuine groundwater were used for the biosorption experiments.

The removal efficiency for heavy metals biosorbents generally increased with the increase of their amounts in solution. For *Ralstonia* sp., the removal efficiencies of Pb, Cd, Cu, and Cr dramatically increased over 95 % by the addition of 0.5 g. By adding 0.2 g of *Bacillus* sp., the removal efficiencies of Cd, Cu, Pb, and Zn increased over 90 %. The optimum amount of *Ralstonia* sp. and *Bacillus* sp. for biosorption of heavy metals ions were determined as 0.5 g and 0.2 g for 50 ml solution, respectively. The removal efficiencies of Cd, Cu, and Pb for biosorbents were very low at pH 1 of solution, but dramatically increased at pH 2 and maximized around pH 3 ~ 5. In case of biosorption experiment at different reaction time, the removal efficiency of *Ralstonia* sp. reached over 90 % (85 % for *Bacillus* sp.) within 10 min of reaction time and it maintained as the time increased. From the results of experiment with various initial heavy metal concentration in artificial groundwater, the removal capacity (the mass of Cu and Pb adsorbed per unit mass of *Ralstonia* sp.) linearly increased with the increase of the initial metal concentration in solution and their removal efficiencies increased at the range of 0.05 ~ 5 mg/L in solution. However, the capability of *Bacillus* sp. to absorb heavy metals reduced (the removal efficiency lowered to less than 30 %) while the initial concentrations of Cd, Cu, and Pb were over 20 mg/L. From the results, bacterial strains, *Ralstonia* sp. and *Bacillus* sp. were investigated as suitable biosorbents for the removal of heavy metals from the groundwater.

Supra-subduction and abyssal mantle peridotites of the Coast Range ophiolite, California: Initiation of Franciscan subduction along a large-offset fracture zone

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The Coast Range ophiolite (CRO) of California is one of the most extensive tracts of oceanic crust preserved in the Cordillera, but its origin has long remained controversial. We present here new data on mineral compositions in mantle peridotites that underlie crustal sections of ophiolite, and show that these are dominantly refractory harzburgites related to high apparent melting in a supra-subduction zone (SSZ) setting. Abyssal peridotite occurs at one location, Stonyford, in the CRO where it is associated with SSZ mantle peridotite and volcanic rocks with both oceanic and arc-like geochemistry. SSZ mantle peridotites are associated with crustal sections containing arc-related volcanics, including boninites. This convergence between conclusions based on crustal lithologies and their underlying mantle sections confirms previous proposals that link the CRO to SSZ processes, and seriously undermines hypotheses that call on formation of the ophiolite at a mid-ocean ridge spreading center.

We also report on the radiogenic isotope characteristics of peridotite clinopyroxenes. Based on the Sr-Nd-Pb-Hf isotopic compositions and estimated temperatures, we suggest that the abyssal peridotite block represents a remnant of large-offset transform oceanic lithosphere at >172 Ma. East-dipping, proto-Franciscan subduction is likely to have been initiated along this fault zone, which produced the supra-subduction zone (SSZ) peridotites in the CRO. We propose that the remnant abyssal peridotites represent a snapshot of the mantle wedge composition prior to overprinting of large sectors by hydrous melting during the subsequent subduction-controlled SSZ processes.