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Effect of HNO_3 and H_3PO_4 on Ion Exchange of Natural Zeolite for Making Agricultural Cultivation Solution from Seawater

Takaaki WAJIMA※, Tomoe SIMIZU※※, Takehiko YAMATO※※ and Yasuyuki IKEGAMI※※※

※Department of Urban Environment Systems, Chiba University, Chiba, Japan
※※Faculty of Science and Engineering, Saga University, Saga, Japan
※※※Institute of Ocean Energy, Saga University, Imari, Japan
E-mail : wajima@tu.chiba-u.ac.jp

Effects of HNO_3 and H_3PO_4 on ion exchange of natural zeolite in a new-simple process, which is a two-step process using calcined hydrotalcite and natural zeolite, for making agricultural cultivation solution were examined. The anion-reduced solution obtained by the treatment of seawater with calcined hydrotalcite (CHT-solution) was neutralized with phosphoric (CHT-solution-H_3PO_4) or nitric acids (CHT-solution-HNO_3), and each four solutions (seawater, CHT-solution, CHT-solution-H_3PO_4 and CHT-solution-HNO_3) was treated with natural zeolite to compare the ion exchange behaviors among these solutions. The pH of the all solutions can be neutralized to 5.5 by zeolite treatment, and the Na^+ content can be removed from the all solution. The tendencies of Na^+ removal in all solutions are almost same, and percentages of Na^+ removal from all solutions are above 95% over 8 times zeolite treatment. The amounts of supplies for K^+, Mg^{2+} and Ca^{2+} to the CHT-solution-HNO_3 is higher than those of other solutions up to 6 times treatment. While almost PO_4^{3-} was removed, NO_3^- was remained in the solution, over 6 times treatment with natural zeolite. Therefore, NO^{3-} is possible to be supplied to the solution as nutrient in the two-step process, but PO_4^{3-} isn't possible.

Key Words : Seawater, phosphoric acid, nitric acid, calcined hydrotalcite, natural zeolite, ion exchange