

## **P-recovery as calcium phosphate from wastewater using an integrated selectrodialysis/crystallization process**

### **Abstract**

A promising and sustainable renewable source of phosphate was obtained through crystallization of calcium phosphate from wastewater. The aim of the present study was to evaluate the feasibility of an integrated selectrodialysis/crystallization process to recover phosphate, in which selectrodialysis was first used to pre-concentrate the phosphate before crystallization in a pellet reactor. The results of selectrodialysis show that an increase in current density, initial pH of the product, and initial feed concentration of phosphate led to an increase in phosphate concentration in the product. The desalination efficiency from wastewater was 87%, the phosphate concentration in the product can reach 16 mM with a purity of 44%, the current efficiency to transport phosphate and chloride was 26.6% for standard anion exchange membrane and 63% for monovalent selective anion exchange membrane. The optimal operational conditions for phosphate recovery with a pellet reactor were examined by changing the initial concentration, the pH and the superficial velocity. A precipitation efficiency of 82.7% of phosphate was achieved at pH 11, an inlet concentration of phosphates of 2.5 mM, a Ca/P molar ratio of 1.5 and a superficial velocity of 61 m/h. From the results, it can be concluded that the pellet reactor combined with selectrodialysis is an appropriate method to recover phosphate from wastewater as calcium phosphate, which is not only technically but also environmentally feasible, reducing water pollution, preventing eutrophication and yielding valuable and sustainable resources.

**Keywords;** Phosphate recovery, Selectrodialysis, Pellet reactor, Calcium phosphate, Crystallization