

# Phosphorus recovery from incinerated sewage sludge ash (ISSA):

## a two-step leaching method

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**Abstract:** Chemical extraction of phosphorus (P) from incinerated sewage sludge ash (ISSA) inevitably results in co-dissolution of metals/metalloids in leachate. This is the main hurdle for recycling P from ISSA in phosphate fertilizer. Based on previous studies, this research focused on a two-step leaching method including EDTA pretreatment and sulphuric acid extracting which can leach out less metals/metalloids while attaining a higher phosphorus purity compared with traditional leaching methods. The leaching conditions of the two-step leaching were optimized for the highest phosphorus purity and the efficiency was compared with those obtained by a single-step leaching (0.2 M of sulphuric acid). Thereafter, the leachate was purified by adsorption of metal/metalloids with two kinds of absorption agents (modified activated carbon and 732 resin). The results showed that pretreated by EDTA (concentration of 0.02 M, liquid to solid ratio of 20:1, reaction time of 240 min) then leaching with sulfuric acid (concentration of 0.2 M, liquid to solid ratio of 20:1, reaction time of 120 min) can extract about 80% of phosphorus and reduce concentration of metal/oids such as Al (by 30%), Cu (by 44%), Fe (by 58%), Mg (by 57%) and Zn (by 76%) compared to the single-leaching method. Purification of leachate by 732 resin attained a higher removal efficiency than those by using the modified activated carbon, especially for major metal/oids (Mg, Al, Ca, Fe and Zn). Overall, the two-step leaching method and 732 resin purification can produce a leachate with a higher purity for fertilizer application compared with the traditional leaching and purifying method, which offers a new method for recycling P from ISSA efficiently.

**Key words:** Incinerated Sewage Sludge Ash, phosphorus recovery, chemical extraction, adsorption.