

## Effect of pH on Removal of Phosphorus from Aqueous Solution Using Alum Sludge

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### ABSTRACT

Introduction of phosphorus (P) into surface water has been an environmental concern since it can cause eutrophication of receiving waterbody. Phosphorus adsorption capacity and solubilities of aluminum (Al), iron (Fe), and organic carbon of alum sludge were tested with ortho, condensed (pyro and tri), and organic P (adenosin) at 1,000 mg l<sup>-1</sup> of initial P concentration, 0.1 of sludge to solution ration (w/v), and pH 3 to 11. The studied alum sludge contained 7.6 mg kg<sup>-1</sup> of exchangeable, 6,615.0 mg kg<sup>-1</sup> of organically bound, and 2,1105.0 mg kg<sup>-1</sup> of amorphous Al. The pH for maximum P adsorption of sludge was 4 to 7 for inorganic P and was 4 to 5.5 for organic P. Beyond the pH range for maximum P adsorption, P adsorption decreased with increasing and decreasing pH. The lowest Al solubility showed at pH 6 for inorganic P and pH 8 for organic P. The solubility of organic carbon showed relatively low without significant change with changing pH at 3 to 7 but the solubility sharply increased with increasing pH above 7. The solubility of Fe also showed the same trend with organic carbon. Adsorption of P and solubility of Al, Fe, and organic carbon are highly dependent on the solution pH. When wastewater is treated for removal of P including both inorganic and organic P using alum sludge, pH 5 to 6 is recommended to maximize P removal and to minimize dissolution of Al and organic carbon which are considered to contaminants.

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**Key words:** Inorganic and organic P, Aluminum, Organic carbon, Optimum removal pH.