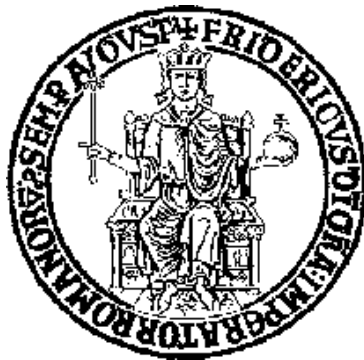


University of Naples Federico II

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Master's thesis in Environmental Engineering



ARSENITE OXIDATION AND ITS REMOVAL FROM THE WATER: THE ELECTROLYSIS PROCESS

ABSTRACT

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Arsenic is a high toxic pollutant even at low concentration levels and produces serious environmental problems in several countries because of its wide presence in groundwater sources used for drinking supply.

Arsenic in water normally occurs in the oxidation states + 3 (arsenite) and + 5 (arsenate). However, the forms, concentrations, and relative ratios of both As(V) and As(III) in water vary significantly, depending on changes in input sources, such as the pH and oxidation potential. Arsenate is less toxic than arsenite, but more abundant and more mobile in natural surface waters, whereas arsenite is found mostly in anaerobic environments such as groundwater.

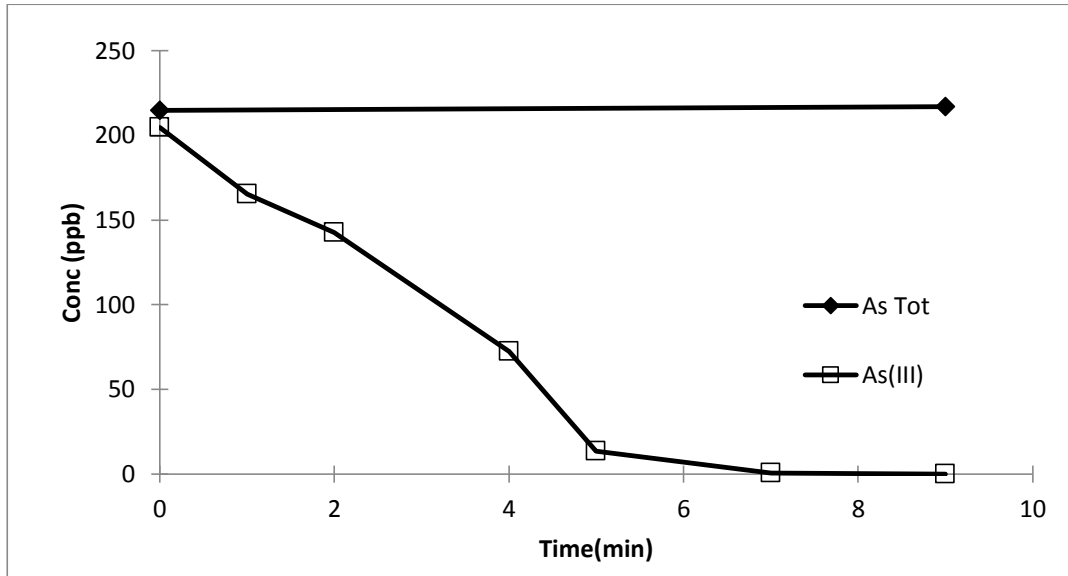
As(III) is more difficult to remove than As(V). The presence of As(III) in aqueous solution usually exhibits a neutral charge and is more difficult to remove from solution, and therefore is usually oxidized to As(V) prior to removal. Oxidation is a previously required step to transform As(III) species in more easily removable As(V) species.

The present work analyzes two aspect related to arsenic.

The first aspect is the electrolytic oxidation of As(III) that can be applied in the treatment of polluted water, by using platinum/stein less steel electrode materials in presence of aged tap water, studying: I) the effect of the presence of other elements in the obtained performances; II) the effect of hydrodynamic conditions.

The second aspect is the efficiency of the extraction of As(V) species produced by electrolytic oxidation (EO) of As(III) solutions, using ZVI adsorption columns followed by sand columns.

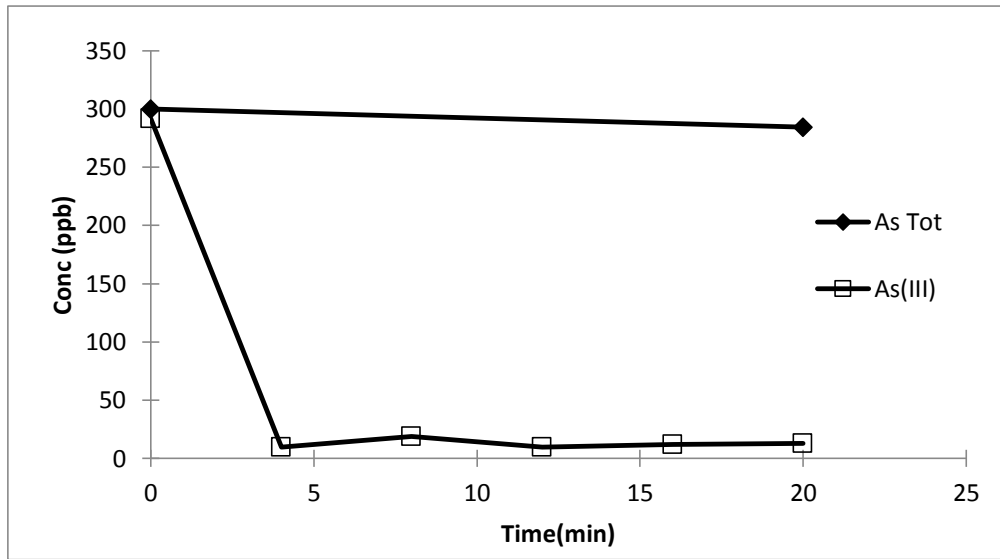
Results obtained in CSTR conditions (or batch mode) were generally very satisfying.



“Batch Arsenite oxidation 7V (continuous), with Ferrous”

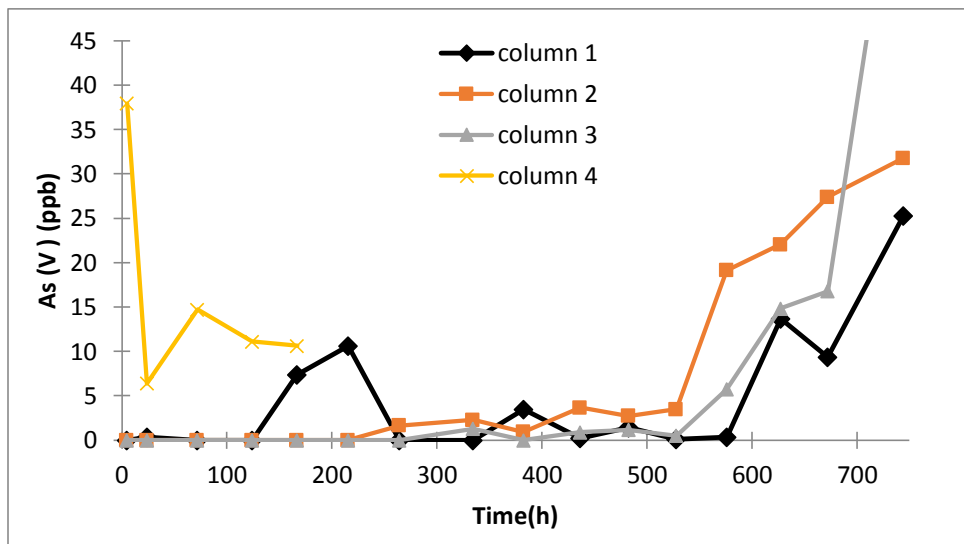
On the contrary results obtained in plug flow conditions (or PFR mode) were less satisfying.

Nonetheless some factors that can have heavily affected the process have been individuated, including the low pump speed.



“As(III) oxidation, pump speed 1 L/min with air and N₂”

Finally results obtained using ZVI showed that the system is a very reliable way to remove the As(V) that comes out from the oxidation reactor.



“As(V) concentration after Fe(0) columns”