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Treatability Test Based on Complex Systems of Co-Preceipitated Coordination: Degraded Area in Rio de Janeiro, Brazil

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Background/Objectives. The issue of contaminated areas has been hotly debated in the business community because it involves high costs and many difficulties of a legal, institutional and communication character, creating problems for urban management with depreciation of property and its surroundings. The present work presents the main results of contaminated soil treatability study with heavy metals originating from urban area in Rio de Janeiro city aimed to point out the best possible alternatives from the technical point of view as well as economic for these areas rehabilitation.

Approach/Activities: This work presents the main results of the treatability tests performed with contaminated soil and groundwater with heavy metals originating from a degraded area in Rio de Janeiro - Brazil. The chemistry of metals in natural environments is governed primarily by two variables: the pH and oxidation potential of the middle. In general, the more acidic conditions favor the solubilization of metals and alkaline conditions possesses higher availability of OH^- anions, providing metal hydroxides formation, compounds which present low solubility, decreasing the concentration of metal in aqueous phase. On the other hand, the redox potential of the middle interferes, especially in the chemistry of metals which form oxyanions, anions which present oxygen and metal atoms. Conditions with high oxidation potential benefit the formation of anions with higher number of oxygen atoms, these anions form more soluble compounds. Four treatability tests were performed for metal fixing using complex systems of co-precipitated coordination for metals precipitation which are shown below:
Test 1: blank (soil+ groundwater); *Test 2*: METALDOWN® (5-20% m/m) + Activator (carbonated alkaline) 0,1% m/m + stabilizer agent Eh/pH 1% m/m; *Test 3*: METALDOWN® (5-10% m/m) + Activator Activator (carbonated alkaline) 0,1% m/m + stabilizer agent Eh/pH 1% m/m and *Test 4*: inorganic bio stimulants of co-precipitation 5% m/m + stabilizer agent Eh/pH 1% m/m. The technique consisted in the reagents application (METALDOWN®) containing metabisulfite ($S_2O_5^{2}$) enabled which results in radical sulfate (SO_3^-).

The tests performed indicated efficiency of the process of complex systems of co-precipitated use more activator (carbonated alkaline) and stabilizer agent Eh/pH for soil treatment where the conditions evaluated presented removals of up to 93% for metals after 14 days of treatment/reaction and allowed to establish the best concentrations of reagents to be used (*Test 2*).

Results/Lessons Learned. The tests performed indicated the full ability of the process of complex systems of co-precipitated use to treat contaminated soil and groundwater with heavy metals. It is recommended that the field application should be monitored and evaluated in terms of their performance, adapting to the local geology and hydrogeology.
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