

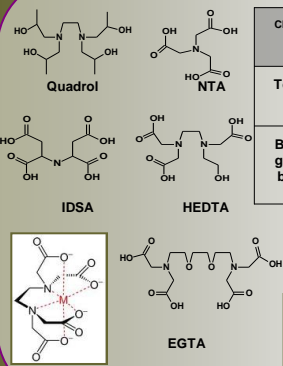
Introduction

Soil washing technique is used for on-site treatment of metals. Metals are especially recalcitrant and not degradable contaminants which typically have a very high vaporization temperature. The main constraints of this technology are the costs of chemical reagents uses and effluents treatments. In order to develop this technology, we worked on reuse of washing solutions. In this study, firstly, we evaluated at laboratory scale to assess the efficiency of a chelating resin (Amberlite IRC748) to regenerate a polluted solutions by complexing traces metals like Cu(II), Ni(II) and Pb(II). Secondly, we evaluated the performance of various chelates for use in this strategy.

Experimental

Chelate s	quadrol	NTA	IDSA	HEDTA	EGTA
Toxicity	L-M	H,C	N	L-M	L
Biodegradability	L	L	H	L	L

L=Low; M=Middle; H=High; C=suspected Cancerigen; N=Not

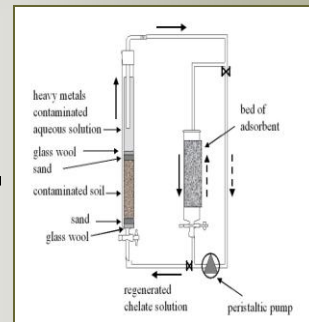


Characteristics of the polluted soil studied

pH	Sand	Silt	Clay	Org. Mat.	Ca	Mg	Fe	Cu	Ni	Pb
7.6	57.4	29.1	13.3	2.2	5150	7000	74	975	950	850

mg kg⁻¹ of soil

Experimental set-up

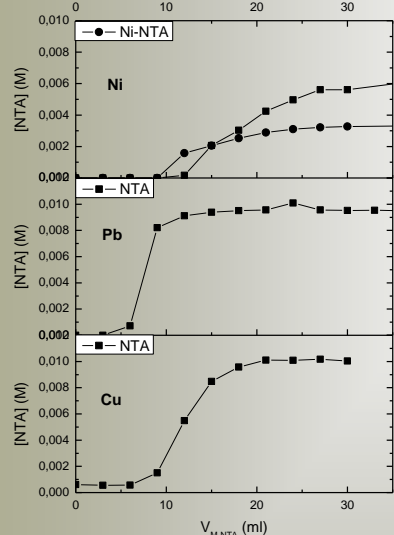


Soil washing in column

Results

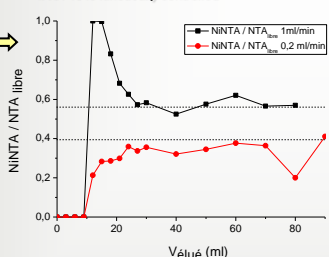
Regeneration of contaminated aqueous solution of chelates on Amberlite® IRC 748

Pb (II) and Cu (II) are completely fixed on Amberlite IRC748; Ligand NTA does not adsorbed it.

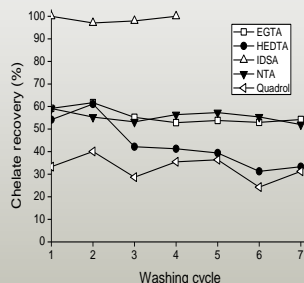


NTA (■) and M²-NTA (●) concentrations (top: Ni; medium: Pb; bottom: Cu) in the eluate after contact with IRC748 Amberlite. [M-NTA]₀ = 10⁻² M; pH_{feed} = 9.0; pH_{eluate} = 11.5; V_{resin} = 10 cm³; volumetric rate : 1 ml min⁻¹; T = 20 °C

Exchange of Ni (II) between NTA and Amberlite® IRC748 is kinetically controlled



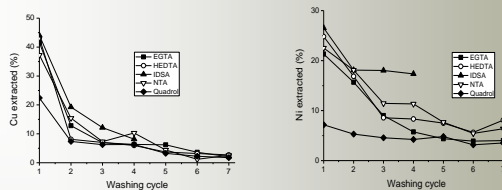
40 and 70% (case of Quadrol) of L1 are adsorbed along the reuse cycle; Except IDSA!



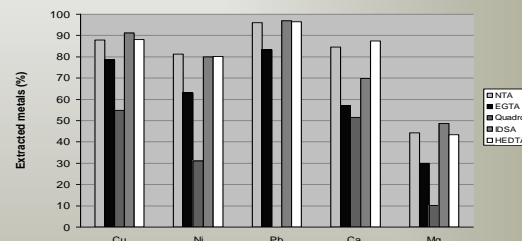
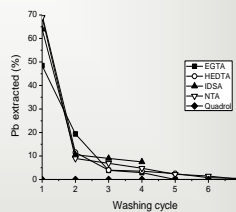
[chelate]₀ = 4.7 × 10⁻³ M; V_{soil} = 400 ml; n_{contaminant}/M₀ = 1; n_{soil} = 50.0g; pH_{feed soil} = 6.0; pH_{eluate} = 6.5-7.5; pH_{resin} = 10-11; V_{resin} = 30 cm³; volumetric rate : 1.3 ml min⁻¹; T = 20 °C.

Effectiveness evaluation of cations metals by chelates

The chelates extracts and solubilize metals



90% Cu extracted after 4 cycles washing for IDSA. Pb (II) is mostly extracted in the two first cycles.



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Conclusion

High yields extractions of metals of about 90% were achieved with 4.7 E-3M IDSA after four washing cycles. Furthermore this ligand is completely regenerate after contact on Amberlite® IRC748. Therefore, this study shown that IDSA is well suited for an on-site treatment of contaminated soil because non toxic, easily biodegradable, without loss in the soil and the resin.

References

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