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Study of the effectiveness of some chelant agents for the remediation of the mercury contaminated soil from Almadén



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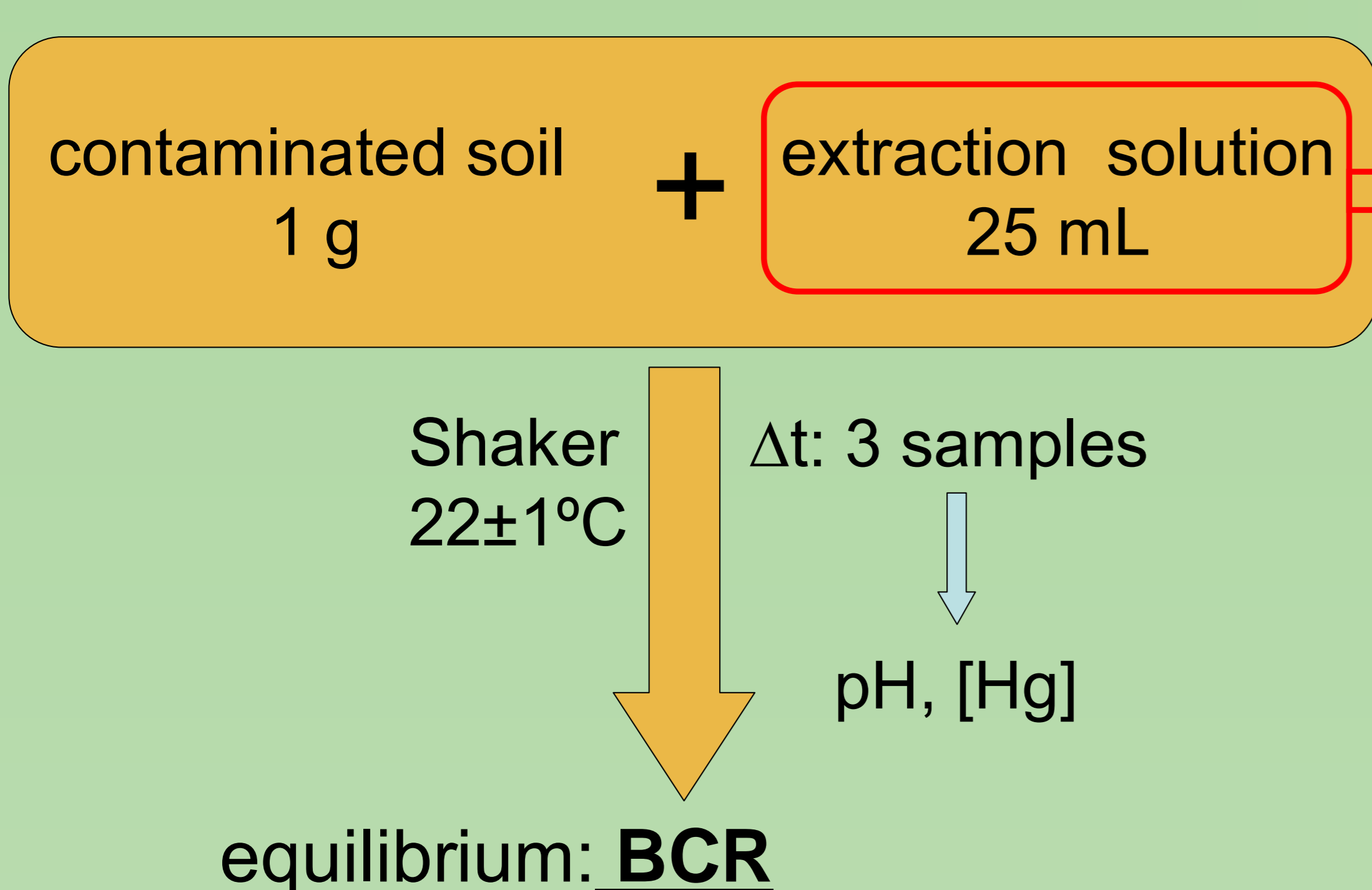
DTU Civil Engineering
Department of Civil Engineering

Introduction

In most of the in-situ remediation technologies for heavy metal contaminated soil the use of an extractant agent is usually needed. Therefore, the corresponding feasibility studies of each technological alternative should include the selection of the most suitable agent. This work studies the effectiveness of some chelant agents for the remediation of the mercury contaminated soil from Almadén mining district (Ciudad Real, Spain) based on lixiviation test together with a standard sequential extraction procedure (SEP). The fractionation of the mercury species by BCR (Bureau Communautaire de Référence) was carried out in the initial soil and in the sample corresponding to the equilibrium of each extractant agent. This procedure provides four fractions, which from higher to lower mobility are: weak acid soluble (WAS), reducible, oxidizable and residual.

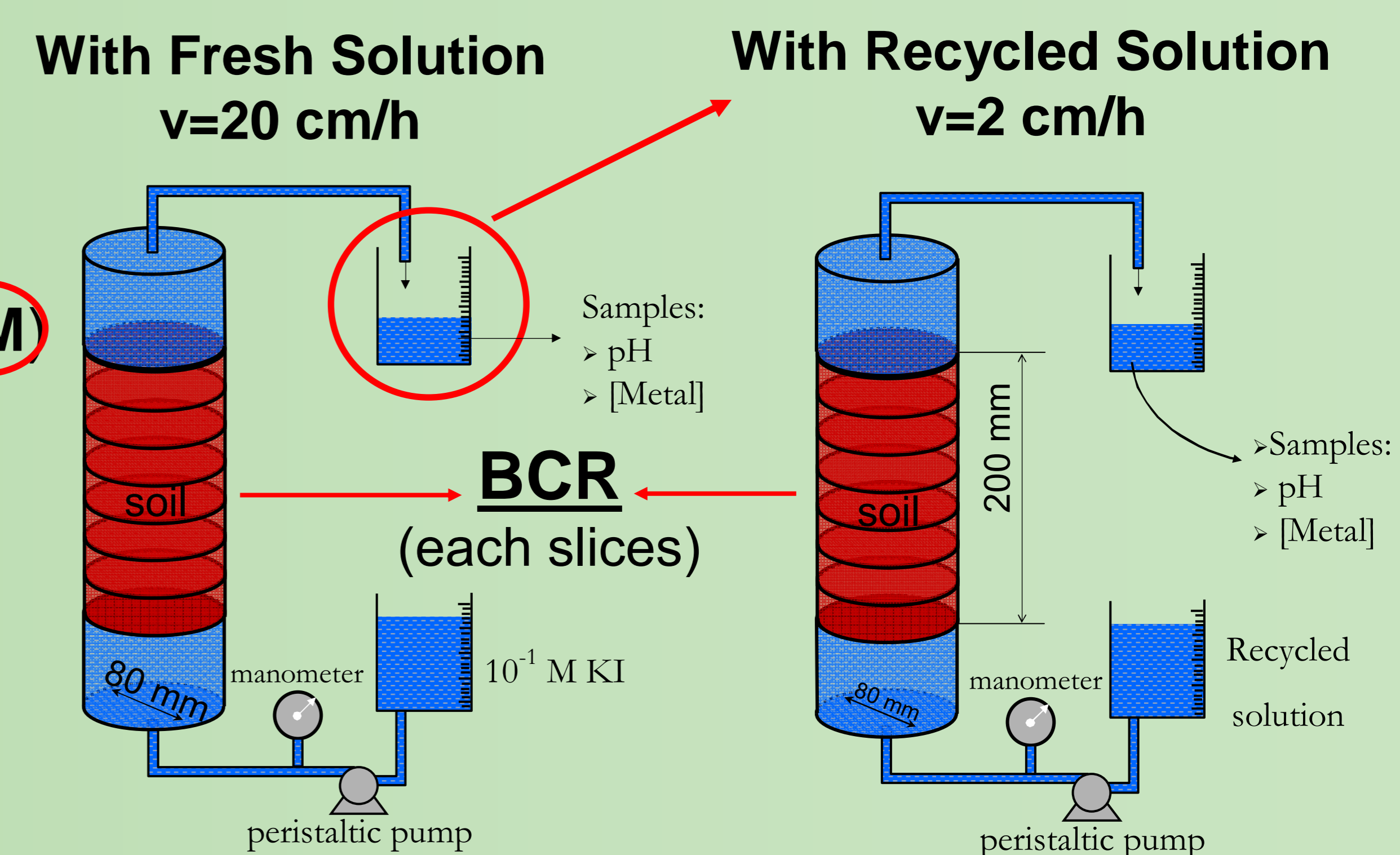
Experimental setup

Batch chelant extraction experiments



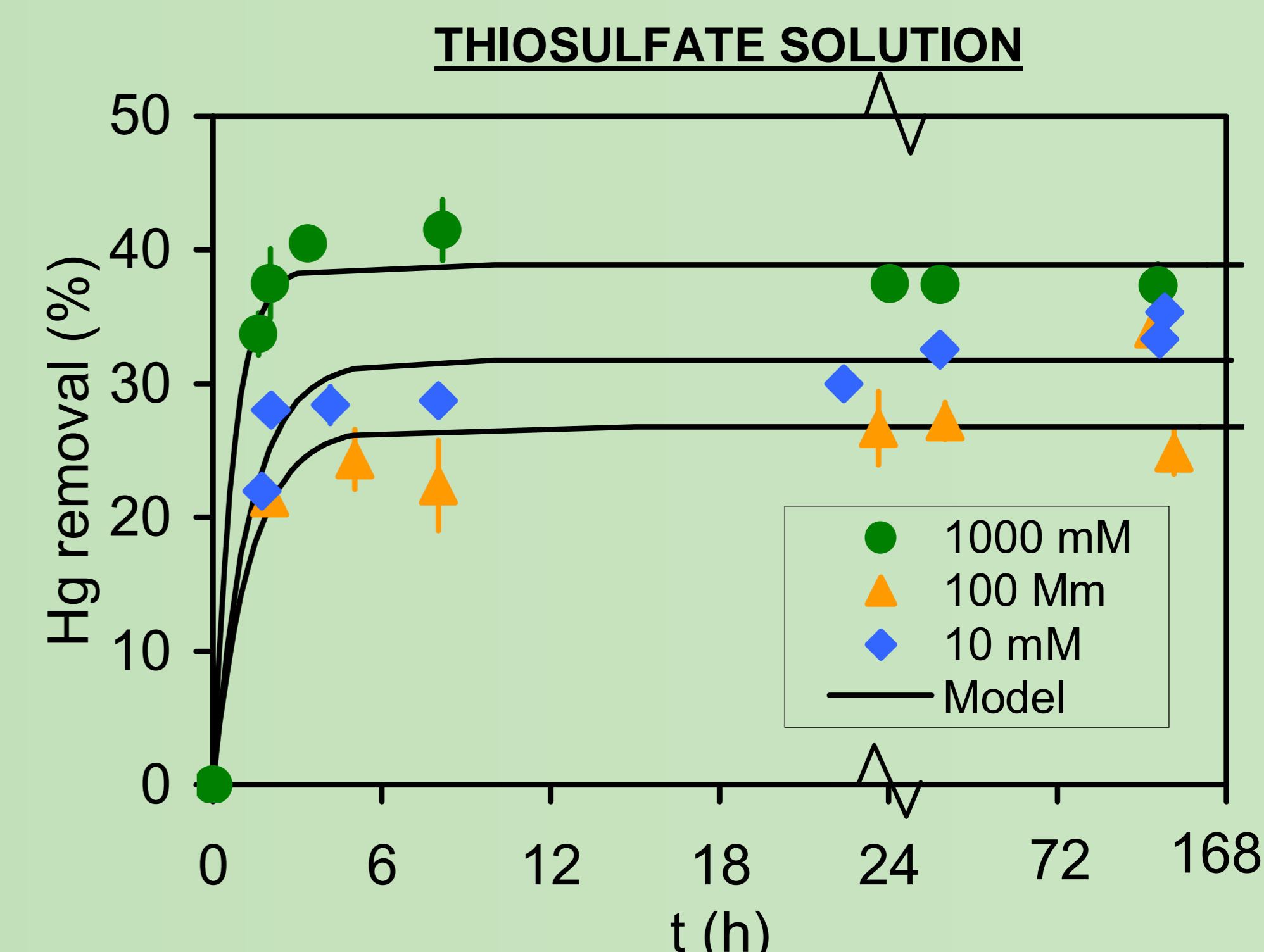
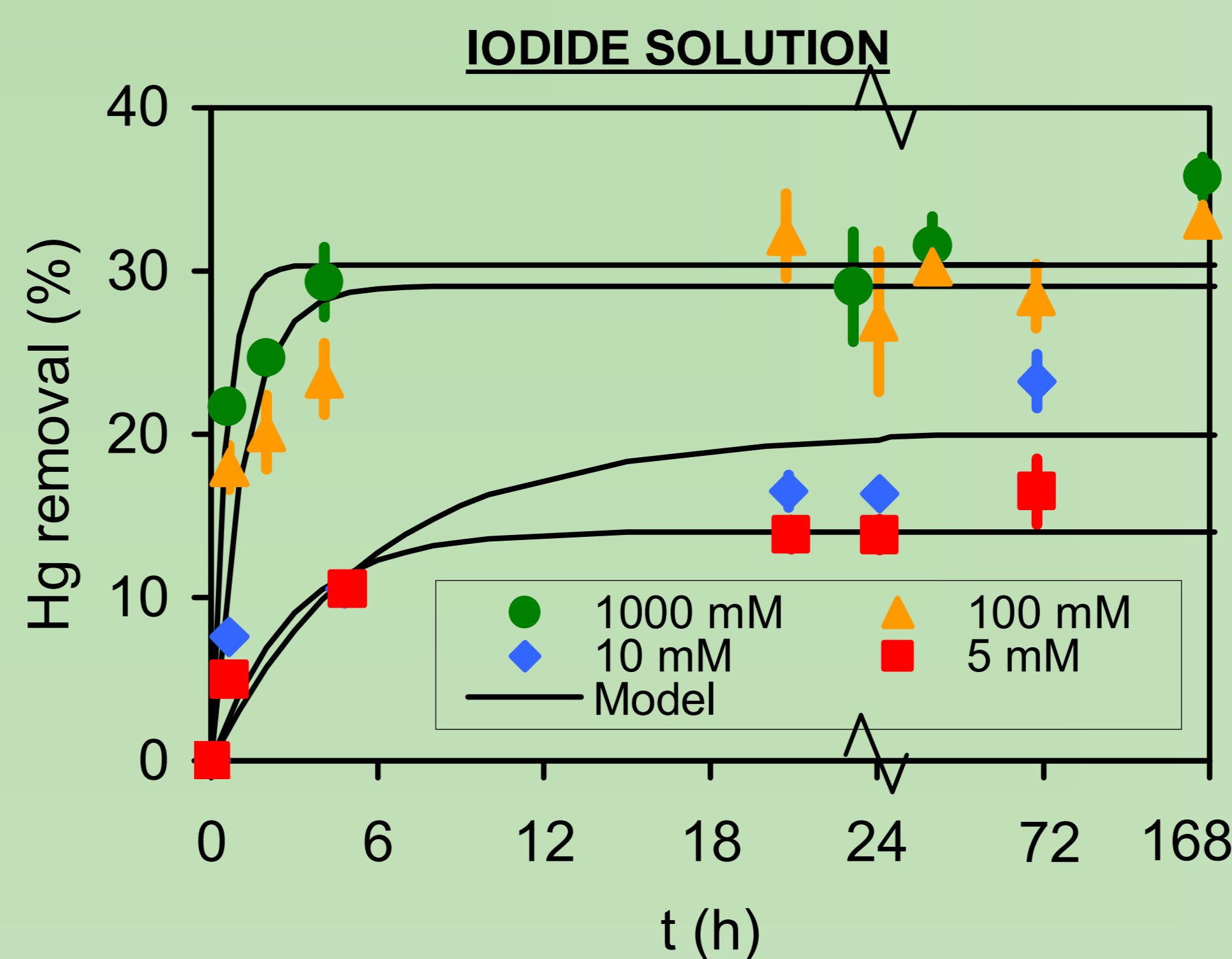
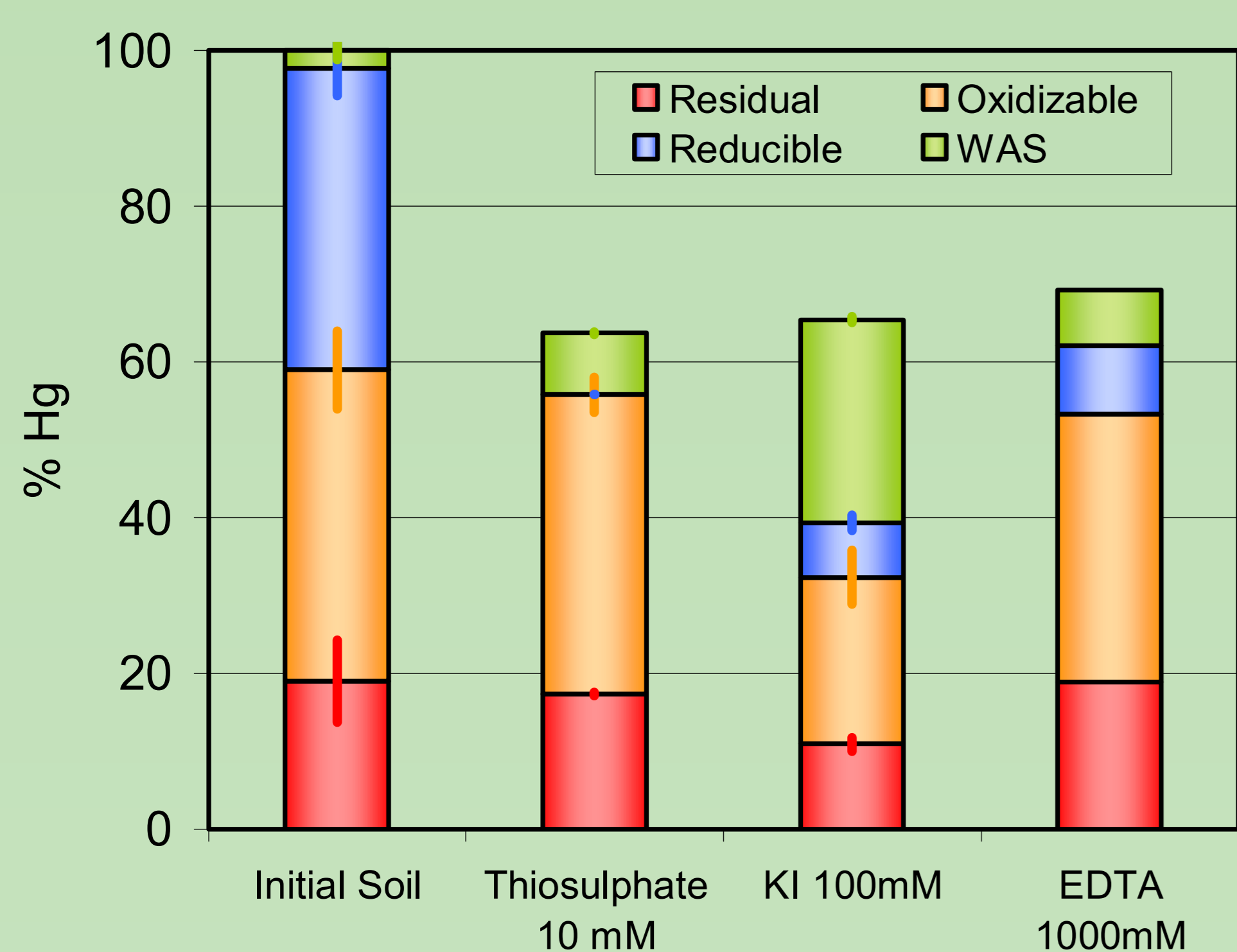
- NaCl (0.01 M, 0.1 M)
- EDTA (0.01 M, 0.1 M, 1 M)
- HNO₃ (0.01 M, 0.1 M)
- Na₂S₂O₃ (0.01 M, 0.1 M, 1 M)
- KI (5·10⁻³ M, 0.01 M, 0.1 M, 1 M)**

Flushing experiments



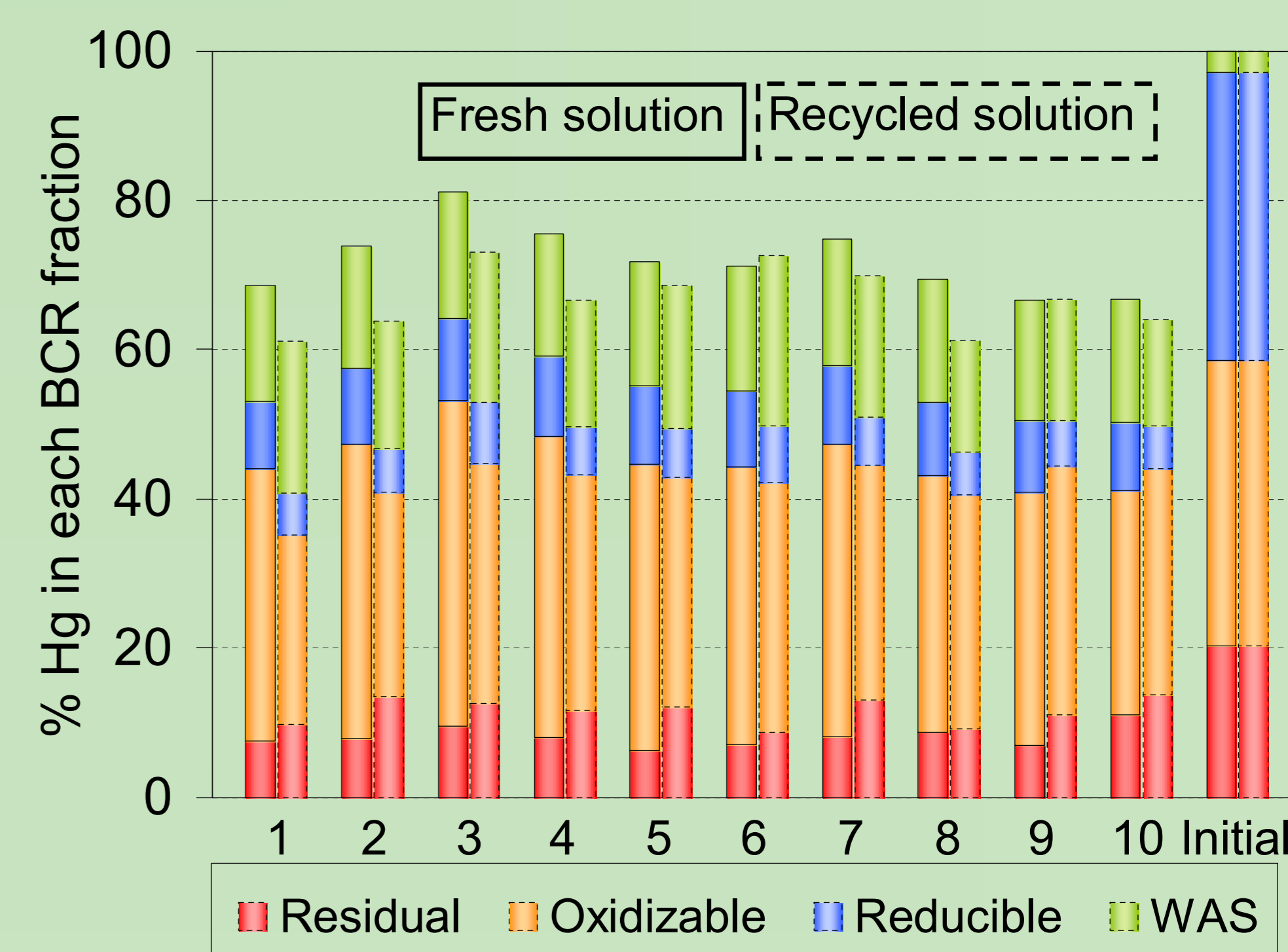
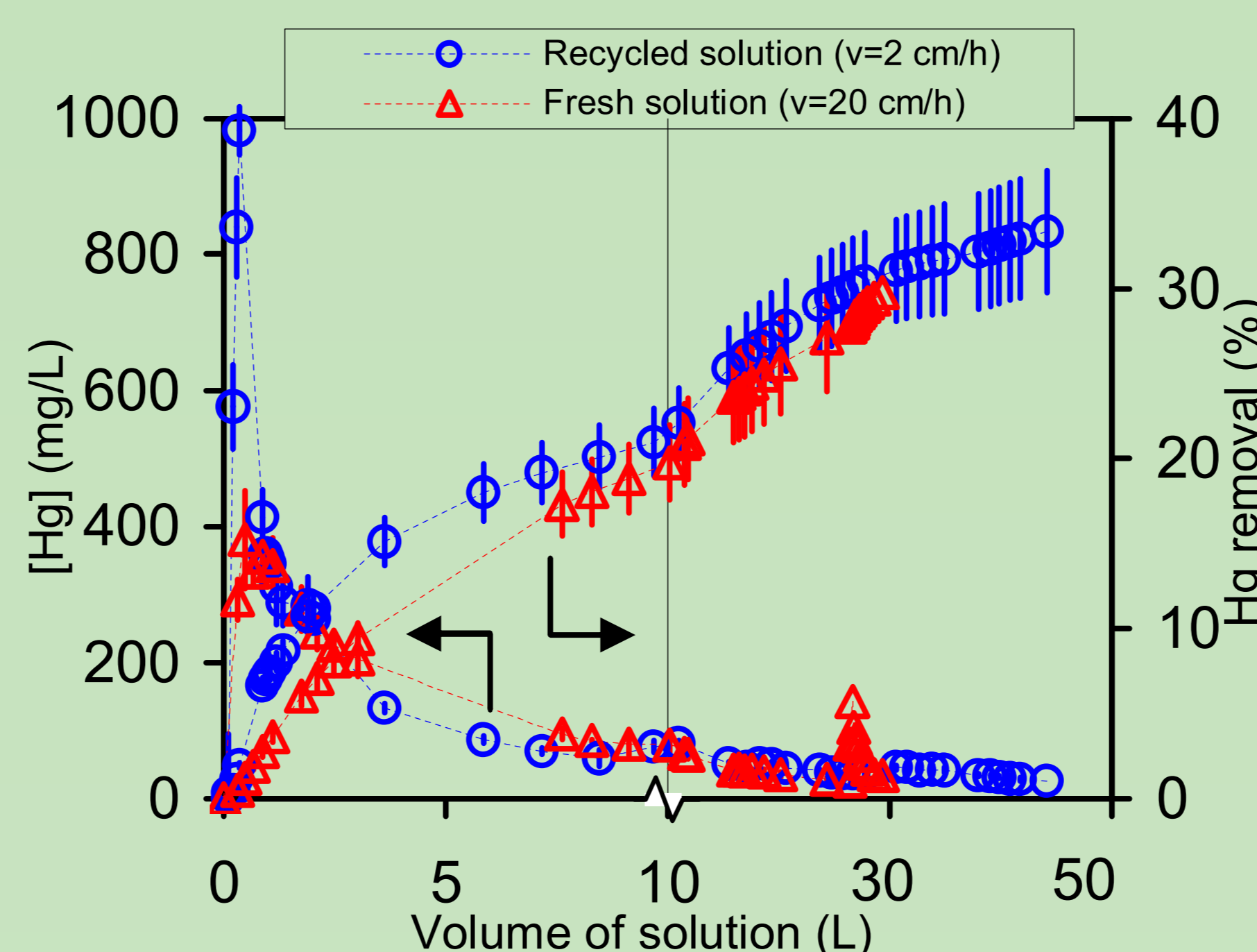
Results

The results indicate that iodide, thiosulfate and the 1 M solution of EDTA yield the best mercury removal percentages. However, the lower EDTA concentration solution and chloride solution extracted at most a 2% of the initial concentration of Hg in the soil. No mercury was extracted by the nitric acid solution.



The figure on the left shows the distribution of the Hg species in the soil after the batch chelant extraction experiments. Comparing with the results from the initial soil, the weak acid soluble fraction in the soil after each treatment is higher than before treatment. This may result in an increase of the environmental risks because this is the most mobile fraction.

After the evaluation of the best extractant agent for the remediation, we have explored its possible application for soil flushing. When iodide is used as chelating agent in the flushing experiment, a 35% of the mercury can be removed and the speciation results were similar to the ones obtained in the batch experiments.



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