

Column tests for the proposal of the design of the permeable reactive barriers

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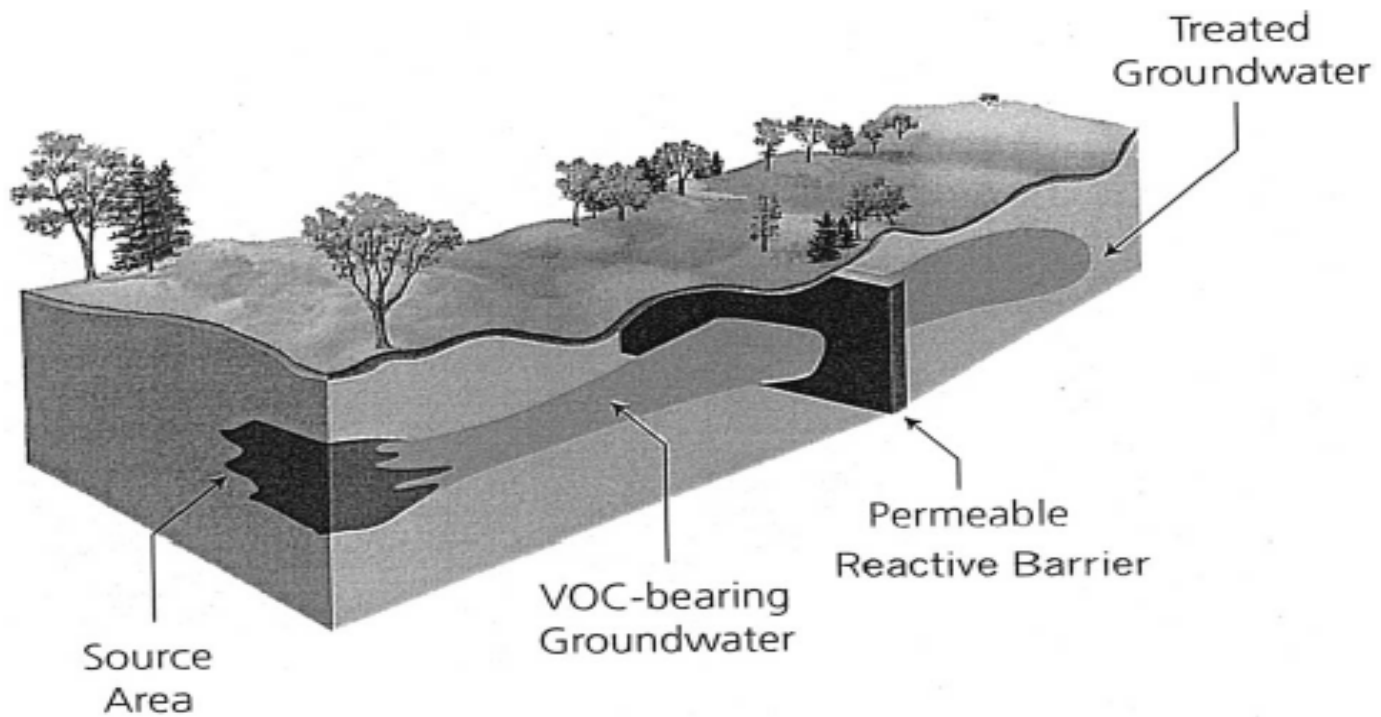
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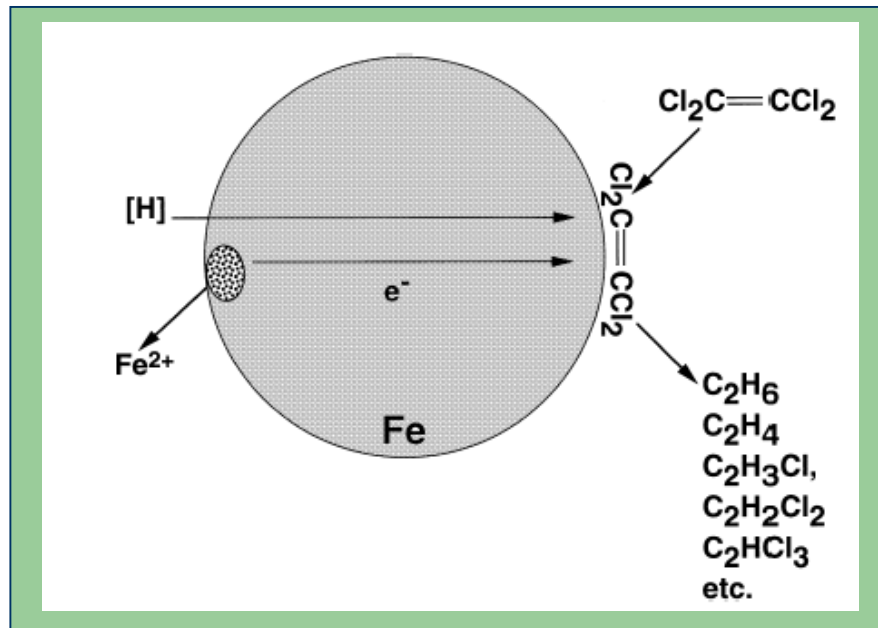
Content

- Introduction to PRBs
- Why column test ?
- Column tests
 - Design
 - Results
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PRBs



Principle of PRBs – zero valent iron



Why column tests ?

Thickness of PRB

$$b = v \bullet t_{res} \bullet SF$$

$$t_{res} = \left[\frac{-\ln(C_T / C_i)}{k} \right]$$

First order reaction

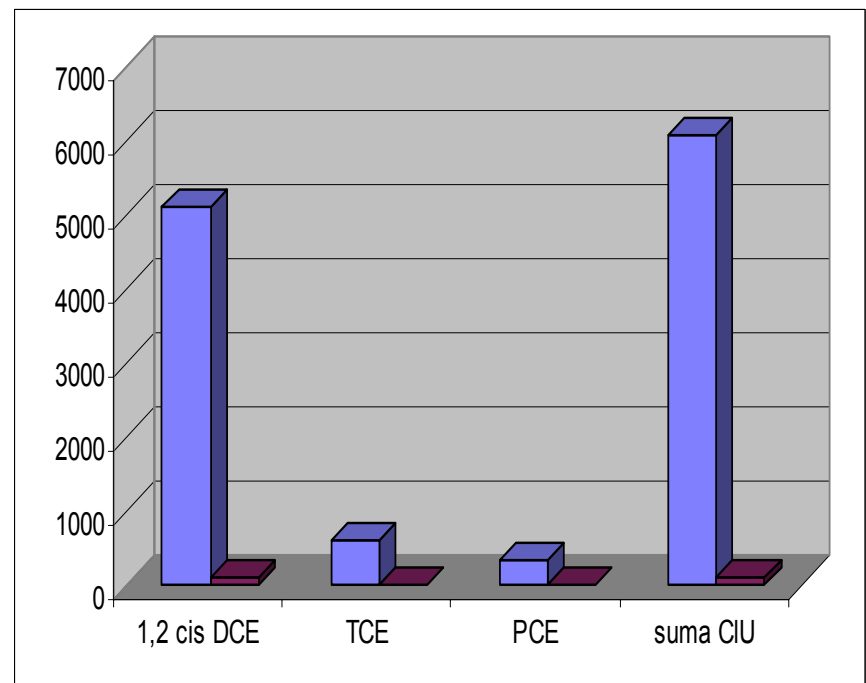
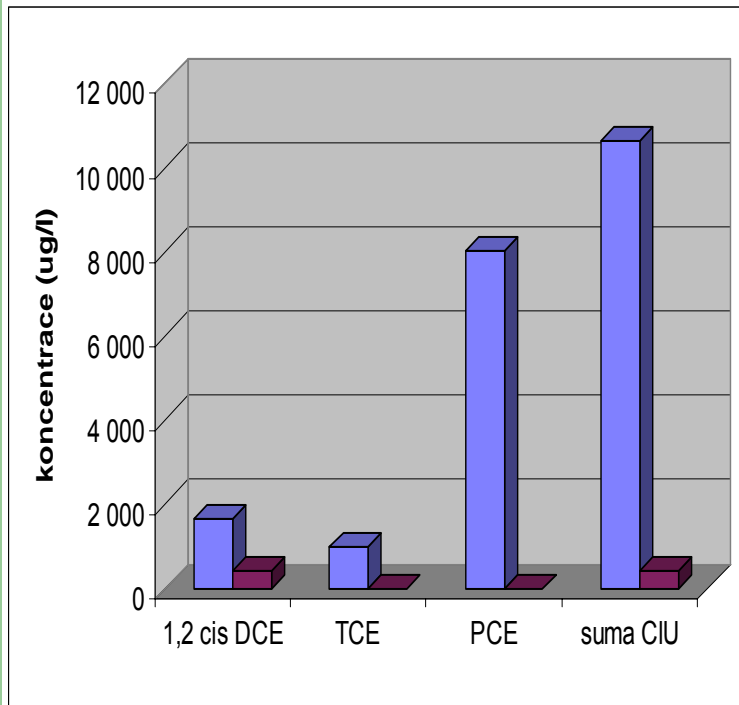
$$t_{1/2} = \frac{\ln(2)}{k}$$

Column tests

- To find out:
 - Half-lives
 - Chemical changes



Results (1): contamination



Results (2): half-lives

Column test 1

- PCE 3.8 hrs
- TCE < 4 hrs
- **1,2 cis DCE 25 hrs**

Column test 2

- < 3 hrs
- < 3 hrs
- 12.6 hrs**

Reasons of differences

- Composition of contamination
 - Case 1 15 % of 1,2 cis DCE
 - Case 2 83 % of 1,2 cis DCE

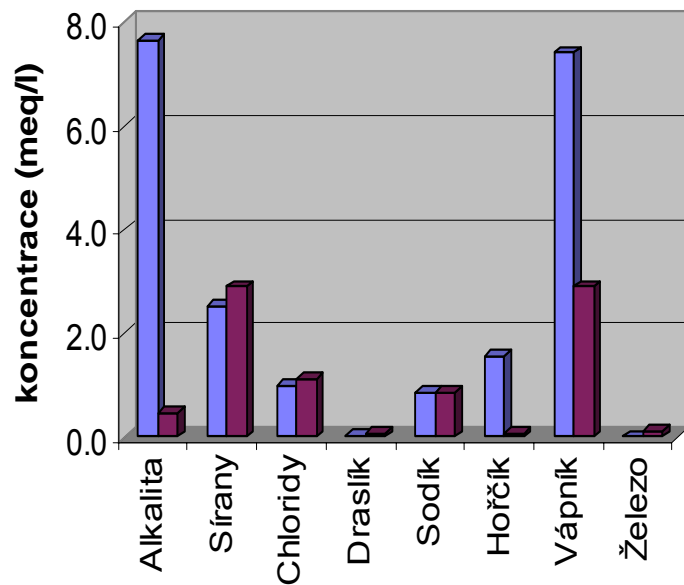


TCE \Rightarrow chloroacetylene \Rightarrow acetylene \Rightarrow ethene \Rightarrow ethane

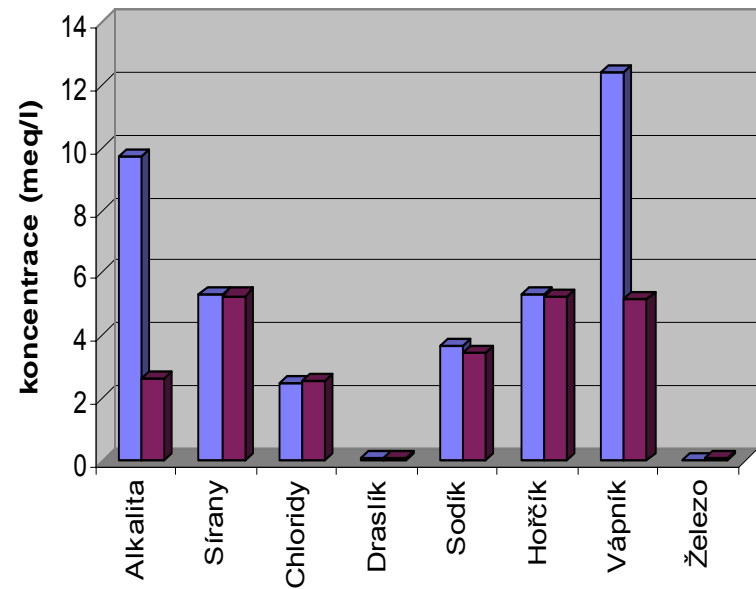
TCE \Rightarrow cDCE \Rightarrow VC \Rightarrow ethene \Rightarrow ethane

Results (3): change of chemism

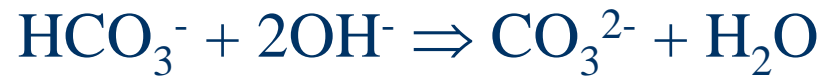
pH: 7.1 to 9.8



pH: 7.0 to 8.5



Reactions



Increase of pH could slow down degradation rates

Conclusions

- Column tests are necessary tools for proposal of PRBs design
- Reactivity of material is dependent on the distribution of chloroethenes and chemical composition of water
- Next step > assessment of change of pH on the reactivity

Thank you

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