CHOOSING OF BARRIER MATERIALS FOR HUMIC REACH GROUNDWATER TREATMENT

Ivan KOZYATNYK, Lars LÖVGREN, Mats TYSKLIND, Peter HAGLUND

Departement of Chemistry, Umeå University,

Umeå, Sweden

E-mail: ivan.kozyatnyk@umu.se

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Evaluation the ability of several prospective PB materials to remove heavy metals and organic pollutants from DOM-rich groundwater (containing 100 - 800 mg L^{-1} dissolved organic carbon, DOC).

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- *Soil:*
  - Hg
  - some ”kis-ash” (As)
  - PCBs
  - PAH
  - Detected conc. chloroaliphatic, chlorobensen, DDTs, DEHP, aliphatics

- *Ground water:*
  - Hg
  - Cr, Pb, As, Ba

STUDIED MATERIALS

Material	Supplier
Activated carbon, Norit GAC 1240W	Sigma-Aldrich
Fly ash	Hörneborgsverket, Övik Energy AB, Sweden
Lignite	SEKAB-pilot plant, Örnsköldsvik, Sweden
Torrefied material (pyrolysed pine stemwood pellet solid char 47%)	In house
Peat	Hörneborgsverket, Övik Energy AB, Sweden
Iron, HCA-150N Cast iron powder	Hepure Technologies Inc., USA

Freundlich equation: $q = K_F C^{1/n}$

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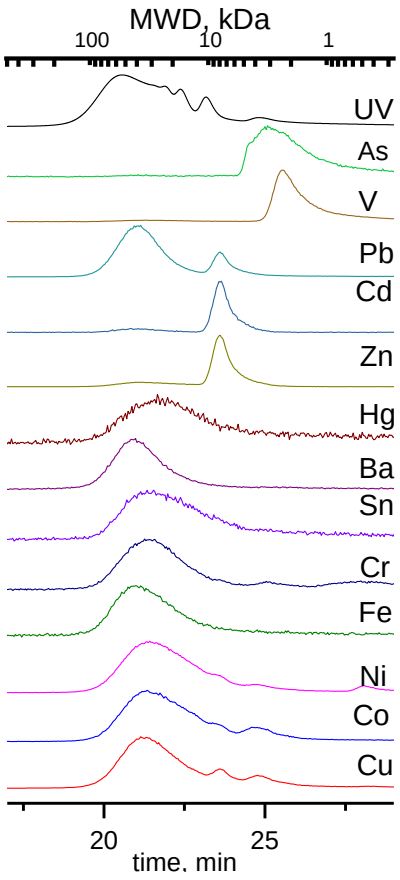
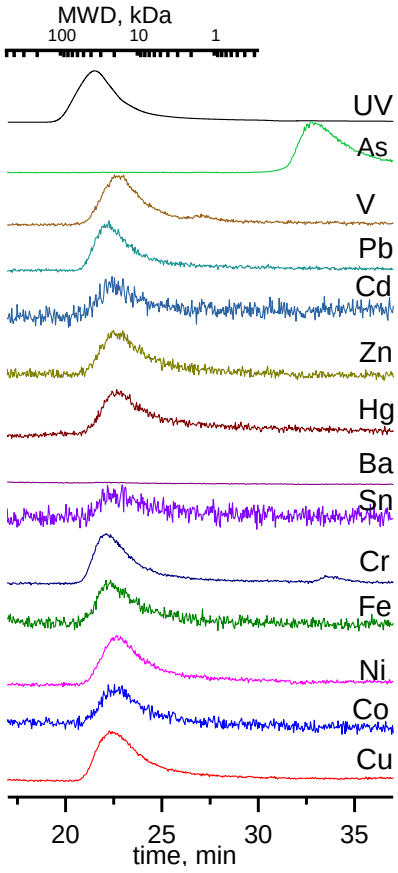
INTERACTION OF HEAVY METALS WITH DISSOLVED ORGANIC MATTER

Ground water



Fulvic acids



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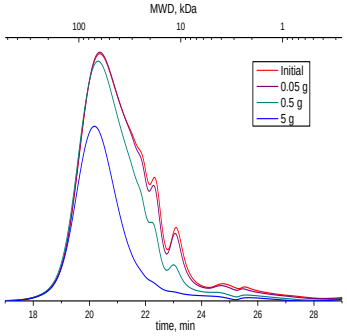
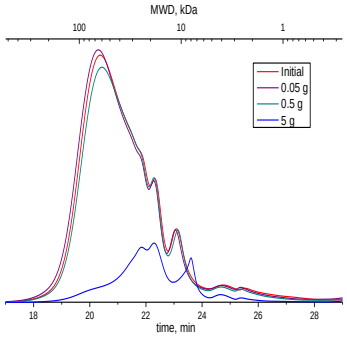
MWD CHANGES OF GROUNDWATER DOM DURING ADSORPTION STUDY

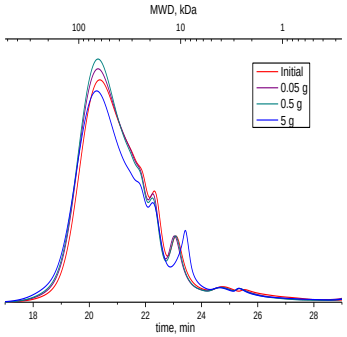
Activated carbon



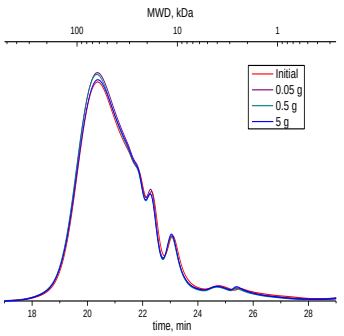
Fly ash



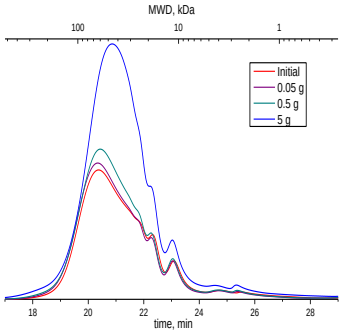
Lignite



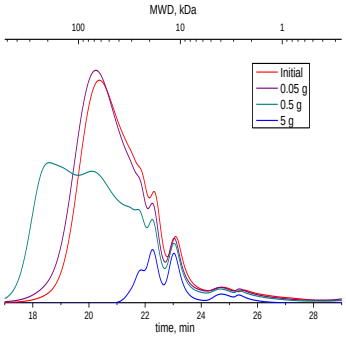
Torrefied material



Peat



Iron (aerobic)



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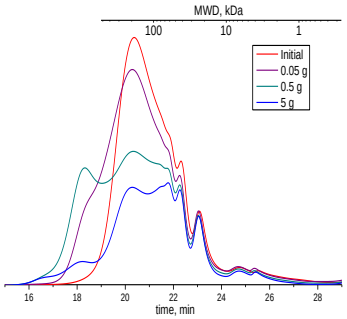

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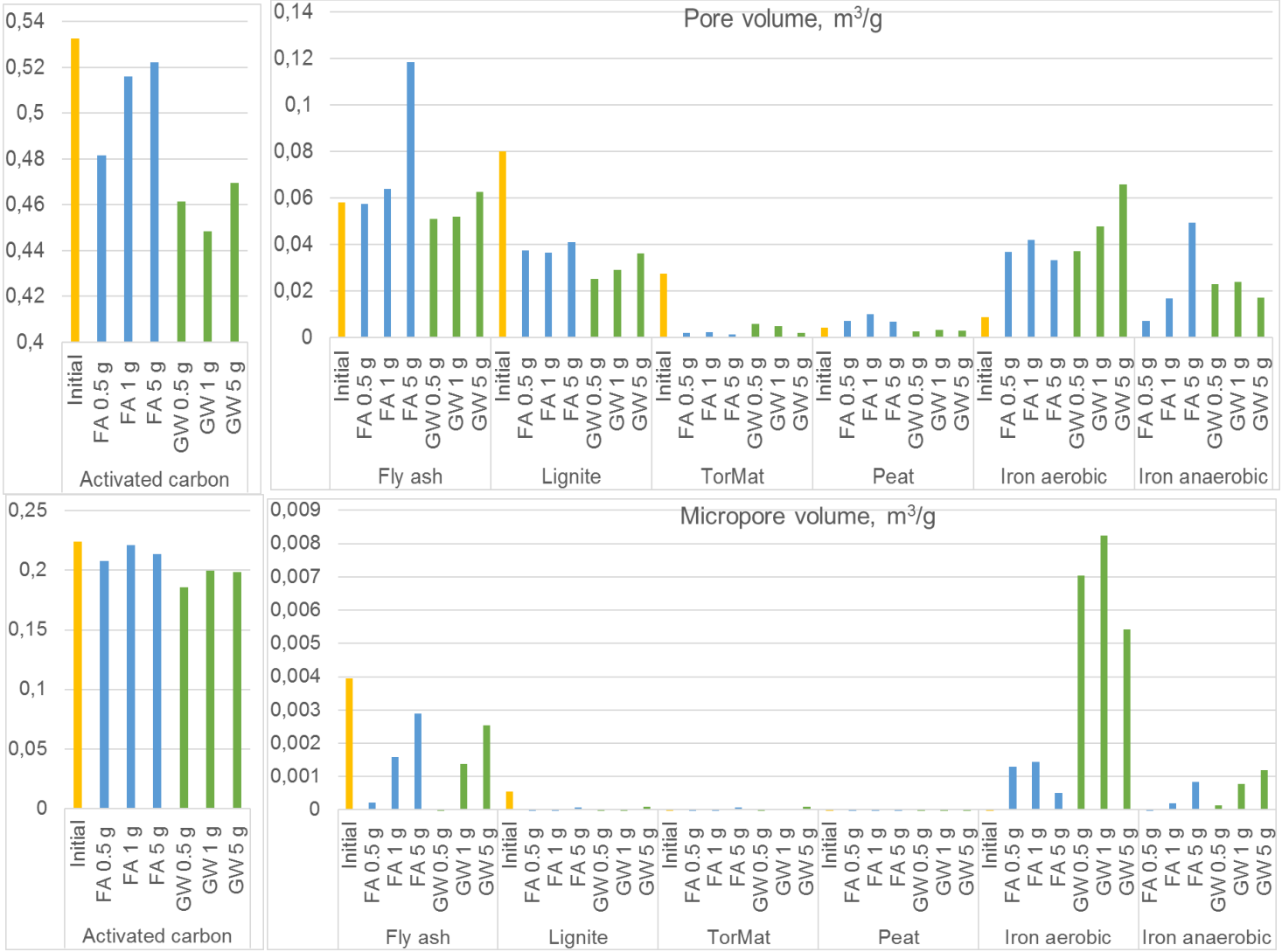
CHANGES IN PORE VOLUME



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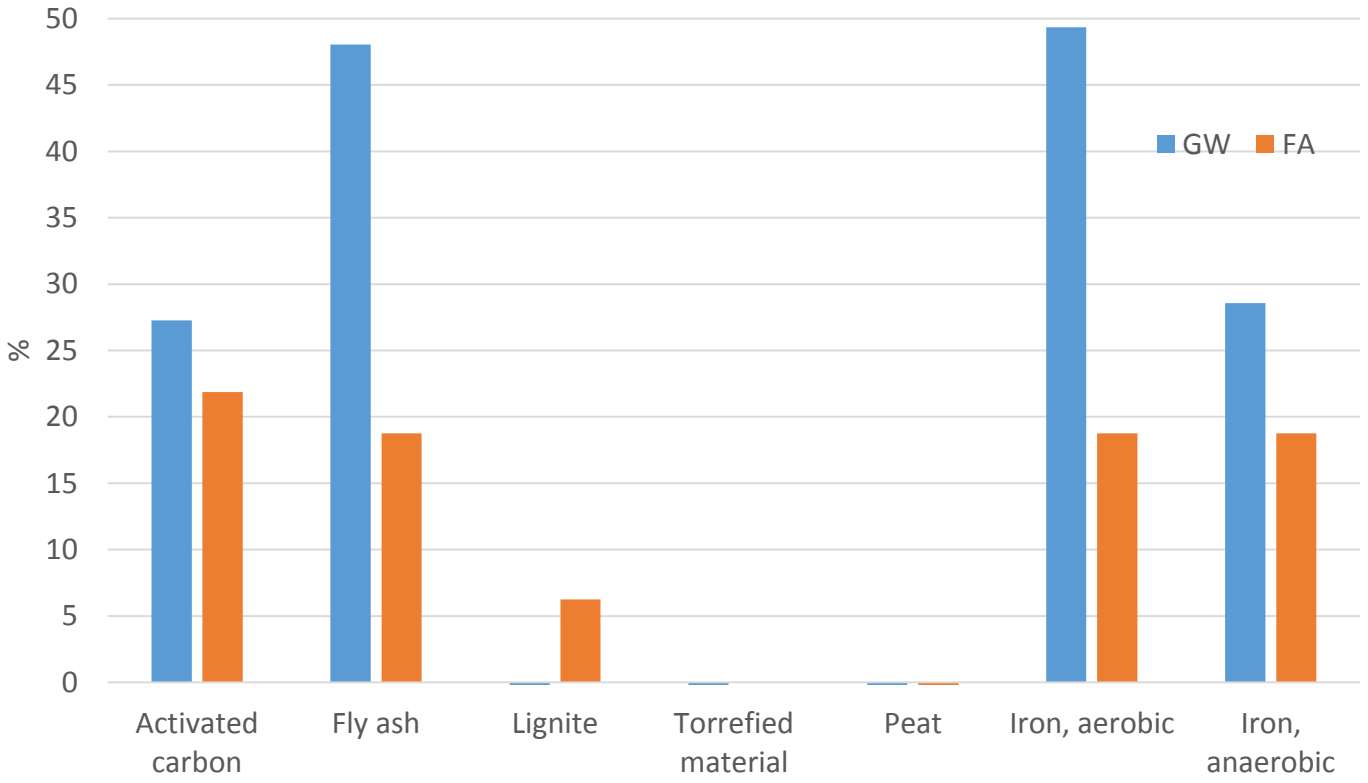
REMOVING OF DOM WITH HIGHEST DOSE OF EACH SORBENT



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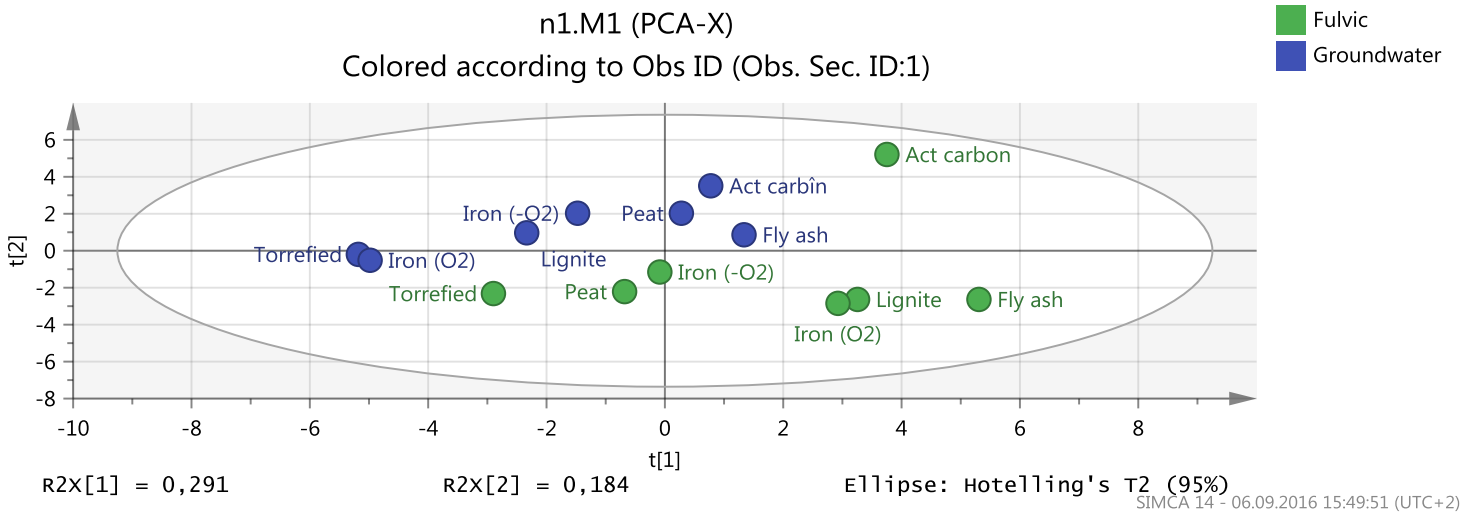
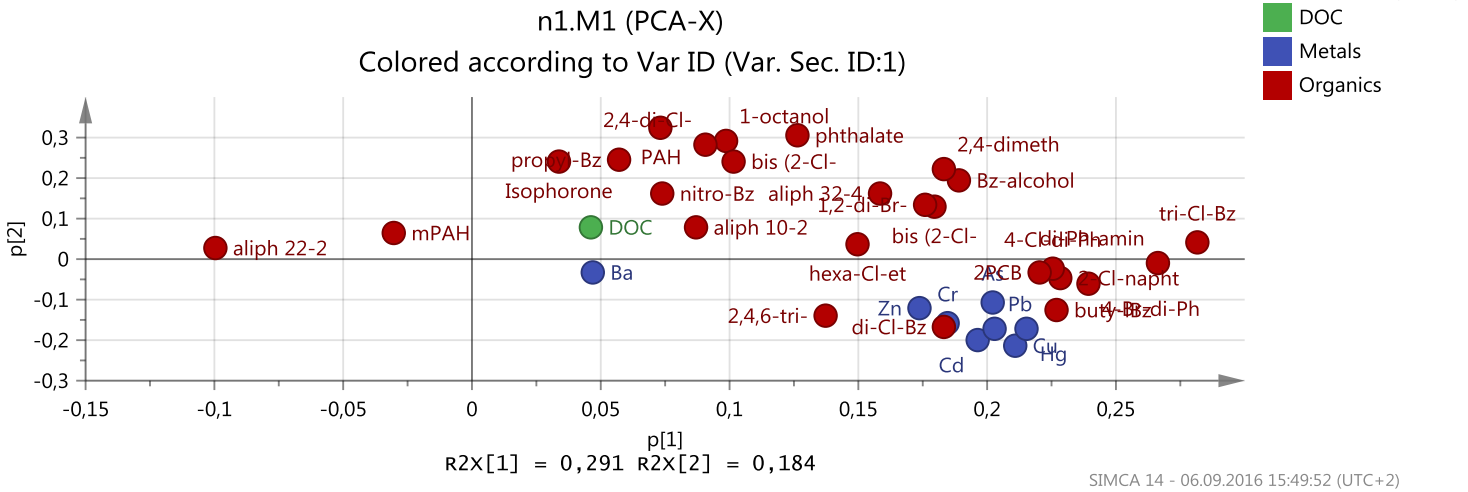
PCA FOR n COEFFICIENT DATA (RELATED TO THE STRENGTH OF SORPTION)





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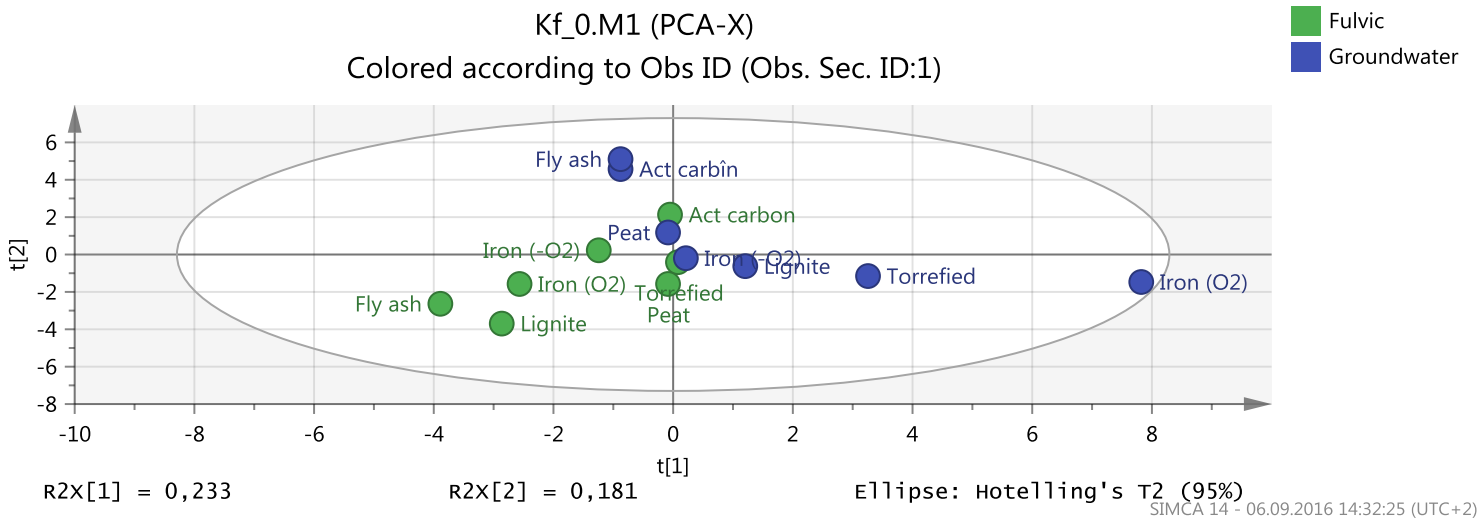
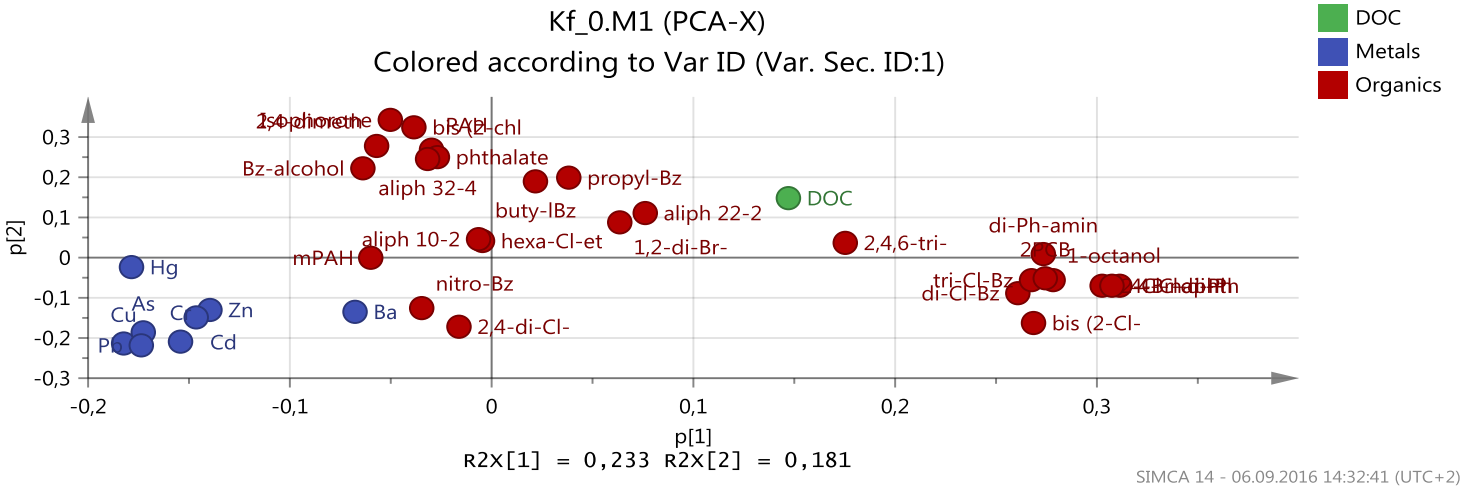
PCA FOR K_F COEFFICIENT DATA (RELATED TO SORBENT CAPACITY)





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CONCLUSION

- Fly ash was one of the most efficient materials for removal of high-molecular weight DOM and metals, with the exception of barium, which was removed better by peat, lignite, iron and torrefied wood. This indicates that most metals are removed as DOM-metal complexes.
- Activated carbon, peat and fly ash were the most effective for organic contaminant removal. Activated carbon also removed a significant fraction of DOM. However, activated carbon seemed to have a limited capacity for removing neutral halogenated aromatic contaminants, for which ZVI under oxic conditions seemed to have a much greater capacity (possibly because of continuous corrosion and formation of fresh surface sites).
- On the whole, fly ash showed the best potential for simultaneous removal of metal and organic pollutants from groundwater. An added benefit of using fly ash for groundwater treatment is that it would contribute to a future circular economy in which a waste is recycled and reused as a resource.
- In summary, batch adsorption experiments followed by SEC characterization and evaluation by PCA are useful methods for characterizing sorbent-DOM and sorbent-contaminant interactions and choosing material suitable for treating water contaminated with multiple organic and inorganic pollutants.

THANK FOR YOUR ATTENTION!

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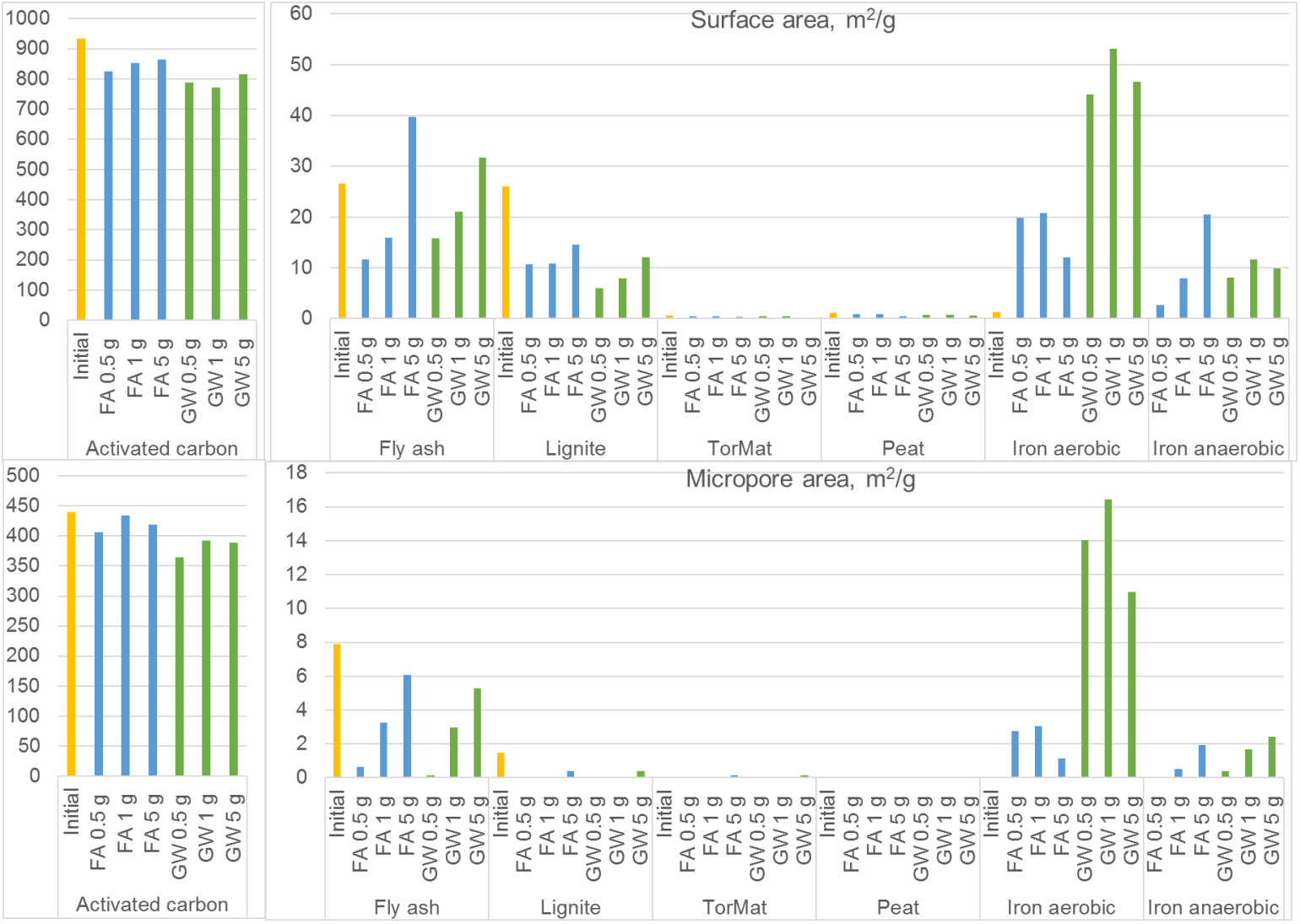
CHANGES IN THE SURFACE AREA



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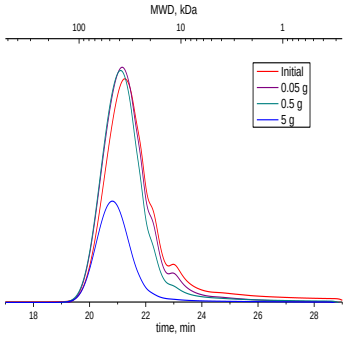
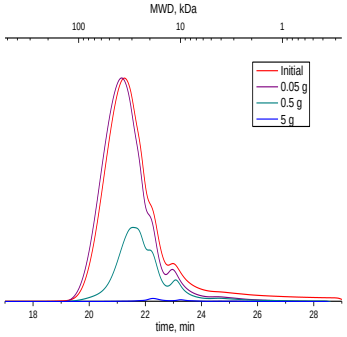


Fly ash



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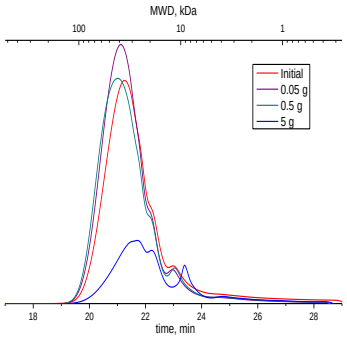

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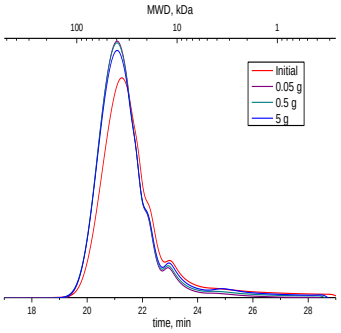

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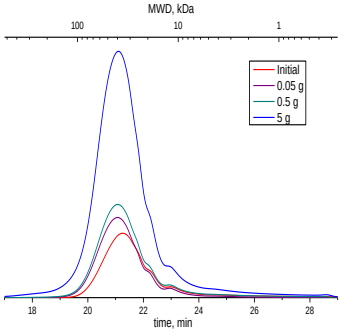

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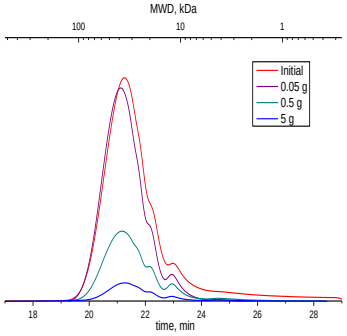

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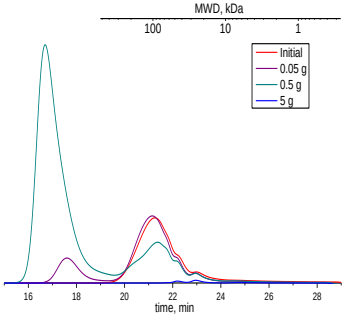

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