PERFORM

- Improving Geothermal System Performance through collective Knowledge Building and Technology Development

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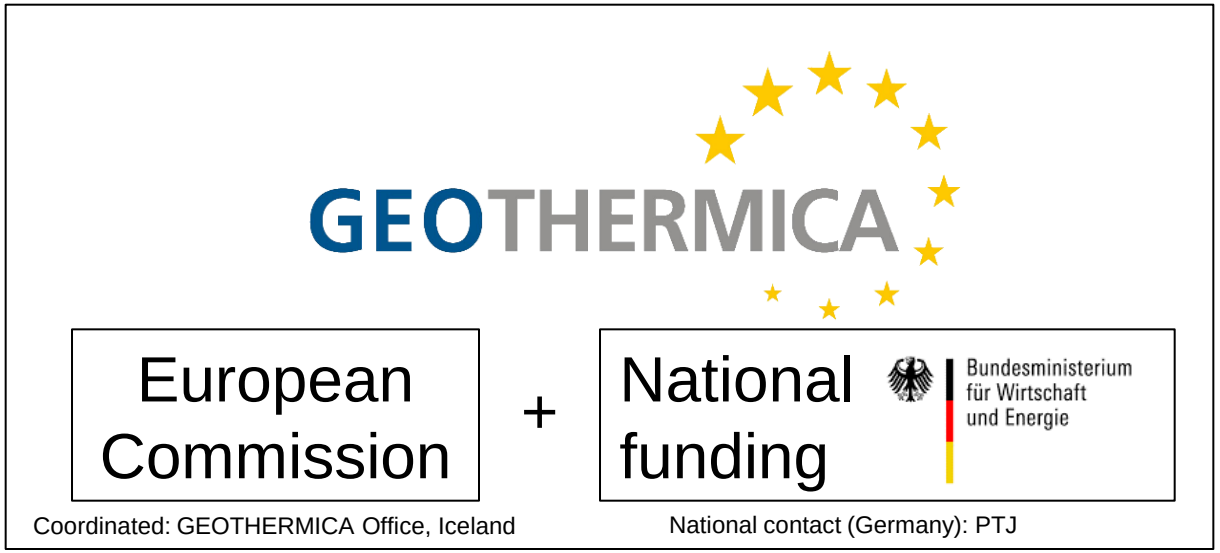


GEOTHERMICA's objective: to combine the financial resources and know-how of the countries together with financial support from the European Commission

→ launch joint projects that demonstrate and validate novel concepts of geothermal energy utilization

June 2018 to May 2021
TRL: 5-6 to 7-8

Joint Program Consortium PERFORM

GFZ Helmholtz-Zentrum Potsdam

Hydroisotop

TNO

WAGENINGEN UNIVERSITY & RESEARCH

Green Well Westland

Ammerlaan The Green Innovator

GEUS

FORCE TECHNOLOGY

Nationales Verbundprojekt

GFZ Helmholtz-Zentrum Potsdam

Hydroisotop

Bundesministerium für Wirtschaft und Energie

Goals and structure

Improve geothermal system performance, lower operational expenses and extend the life-time of infrastructure.

WP 1: To create a knowledge **database**, enabling efficient evaluations of the **causes for poor flow and injectivity**

WP 2: To develop integrated **models** providing **forecasting for scaling, productivity and injectivity** on short- and long-time scales

WP 3: To develop **innovative technologies** to prevent site-specific scaling, clogging and enhance injectivity

WP 4: To optimize production/ injection procedures at demonstration sites → proving a design and **operation toolbox** for the operators

WP 3 Technology Development

Scaling and particle clogging prevention, enhance injectivity

Task 3.1: Testing and evaluating particle filters

Task 3.2: Development, testing, evaluating selective cation removal filters

Task 3.3: H_2S corrosion prevention: Removal of H_2S by $FeCl_2$ addition

Task 3.4: Corrosion and the effect of corrosion resistant alloys

Task 3.5: CO_2-(re)injection and pH-control

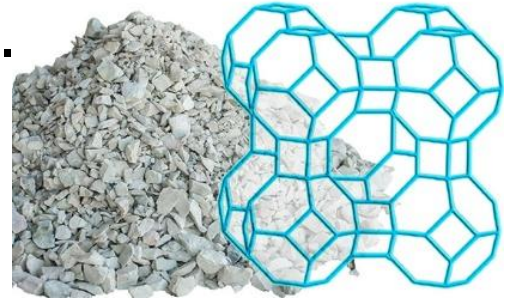
Task 3.6: Injection temperature optimisation

Metal removal by adsorption (Ba, Fe, Pb,Cu)

Goal: Develop adsorption filters for thermal waters → stability and effectivity

Materials:

- Zeolite: clinoptilolite $(Na,K,Ca)_{2\text{-}3}Al_3(Al,Si)_2Si_{13}O_{36}\cdot$



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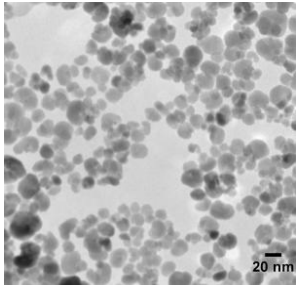
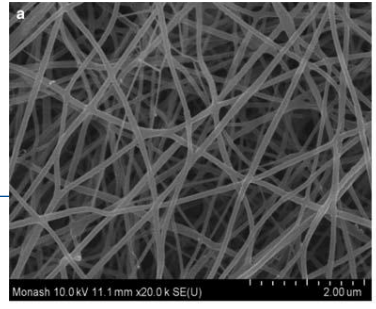
- Iron oxide: e.g. magnetite (Fe_3O_4)



- Chitosan (polysaccharide)

chitin

deacetylization

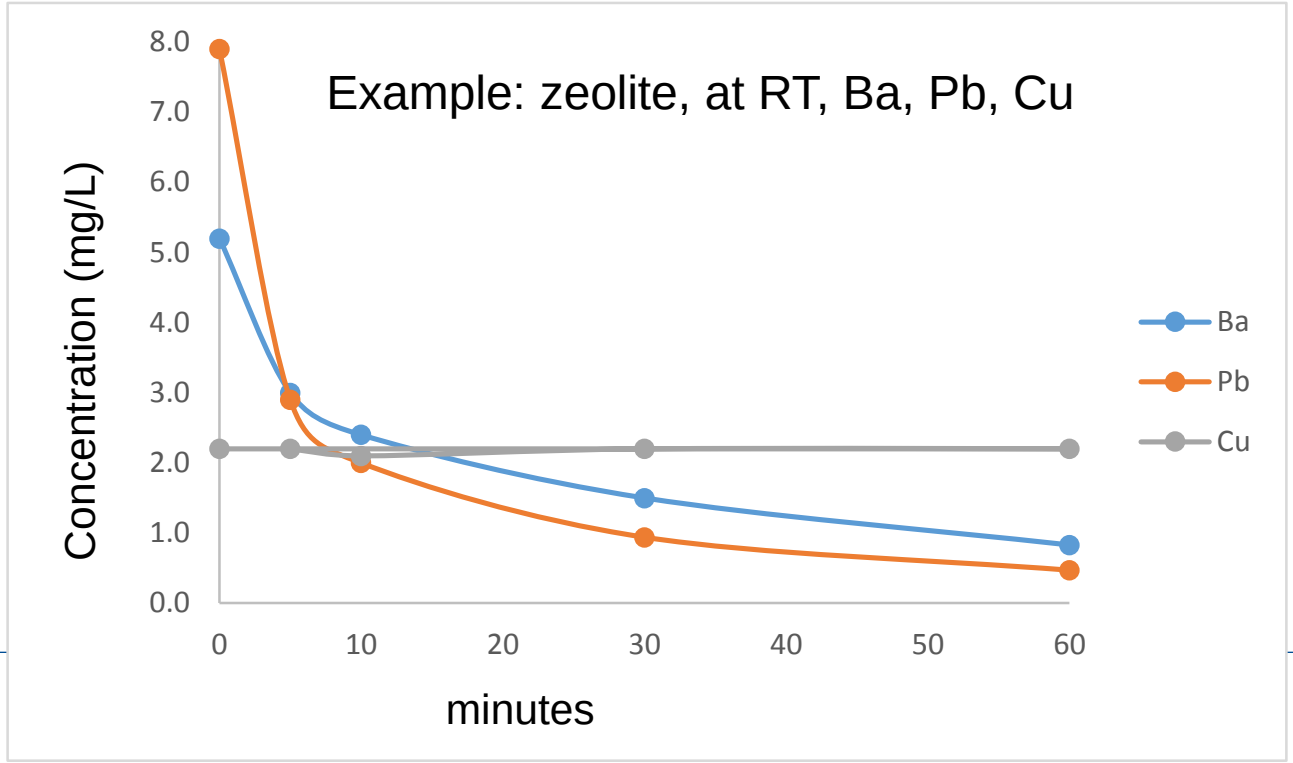


Electro spinning

Production:
TU Dresden
ITM

First tests: static experiments

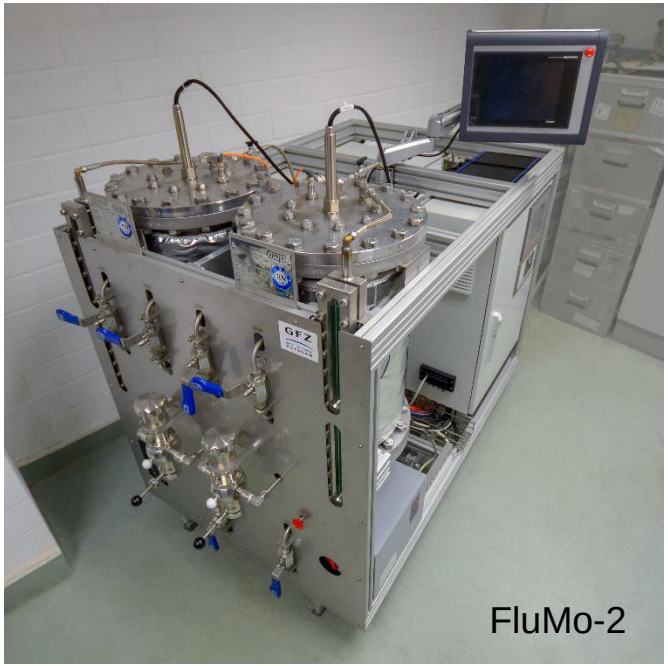
Test for adsorption capacity, metal affinity, reaction speed, temperature stability, temperature effect, competition with other ions, reversibility → batch experiments



Material tests

Flow-through experiments

Bypass at geothermal sites



FluMo-2

Mobile bypass

Site & Country		reservoir	Type of operation
Pijnacker Nootdorp	NL	siliciclastic, Jurassic-Cretaceous	Metal extraction, reactive transport simulation
Honselersdijk			Particle filter, injection temperature, CO_2 reinjection, reactive transport simulation
Groß Schönebeck	De	siliciclast., volcanic Permian	None (database)
		carbonate, Triassic	Reactive transport simulation, particle filters?
Insheim			
Oberlaa	Au	carbonate, Jurassic	H_2S removal
Thisted Varmeforsyning	Dm	siliciclastic, Triassic – Jurassic	none
Sønderborg Fjernvarme			Corrosion control
Margretheholm		siliciclastic, Triassic	Metal extraction, Particle filter, Corrosion control, reactive transport simulation

Thank you

Tanya Golberg, Viola Pul-Verboom van, Lars Kristensen, Laura Wasch, Tanja Ballerstedt, Florian Jasper Zimmermann, Kristensen Lars, Hanne Dahl Holmslykke, Larsen Uffe, Troels Mathiesen, Leon Ammerlaan, Raymond Creusen Chris Claesen, Pejman Shoeibi Omrani, Aris Twerda,Brecht Wassing, Hans Veldkamp, Thibault Candela