Recovery of precious metals from E-waste by sustainable porous membranes (ReMe2)

Project leader
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Partners
Stockholm University
STUNS Energy

Project duration
2023-11-06 to 2025-06-30

SWEDISH MINING INNOVATION

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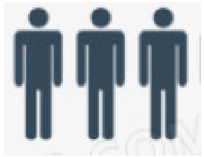
Background

E-waste generated worldwide in 2022

62 M tonnes



7.75 kg per capita

Properly recycled

20%

Value of precious metals in E-waste dumped every year

10 billion USD

- Loss of precious metals
- Environmental issues

Current E-waste recycling technology

Pyrometallurgy

- Energy intensive
- Low selectivity
- Environmental unfriendly

Hydrometallurgy

- Low capital cost
- High selectivity

Associate techniques

- ❑ Electrowinning
- ❑ Chemical reduction
- ❑ **Adsorption**

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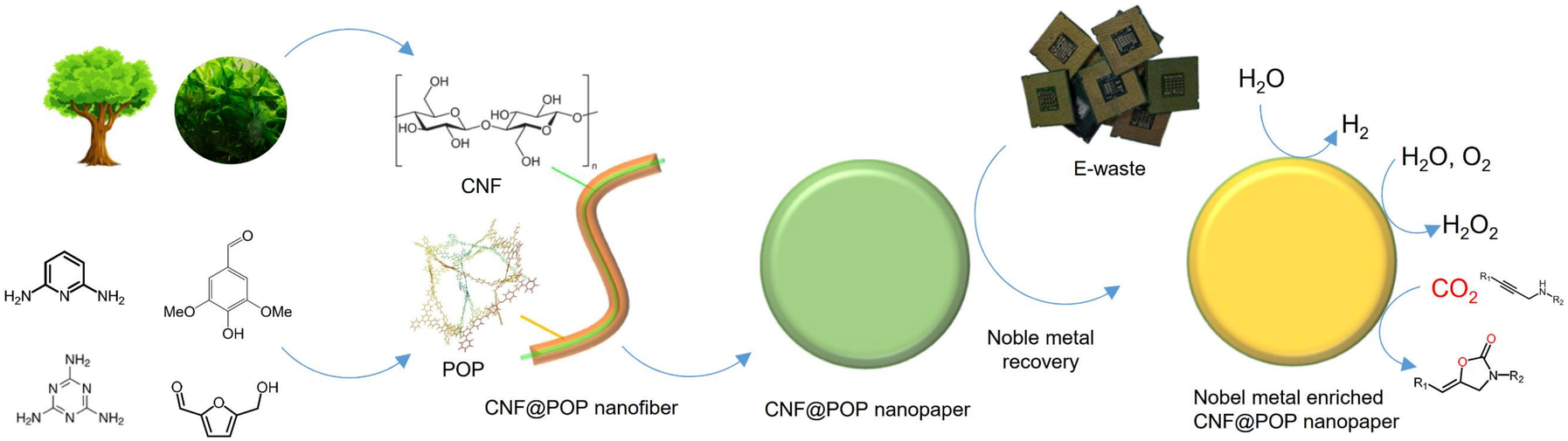
Goals of the project

- **To capture precious metals from E-waste via an efficient and cost-effective membrane separation approach**
- **To promote E-waste recycling, decrease E-waste disposal, conserve precious metal resources, and drive the growth of "urban mining”**
- **To develop the recovered precious metals into efficient catalysts**



Sustainable porous composites | Noble metal recovery | Heterogeneous catalysis

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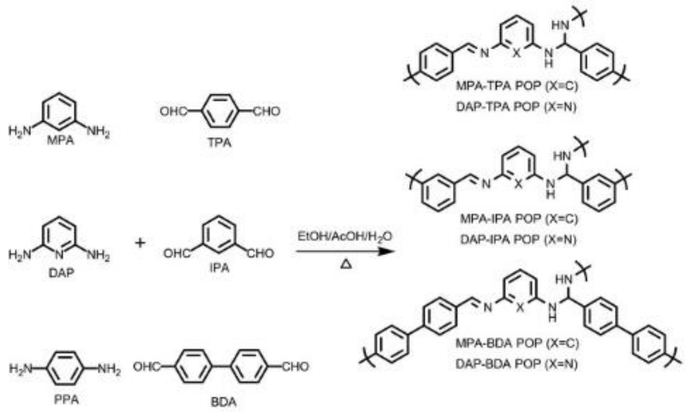
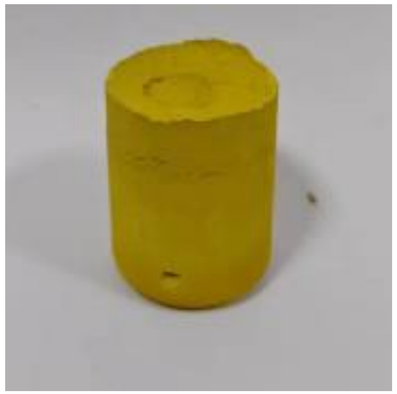
Results so far

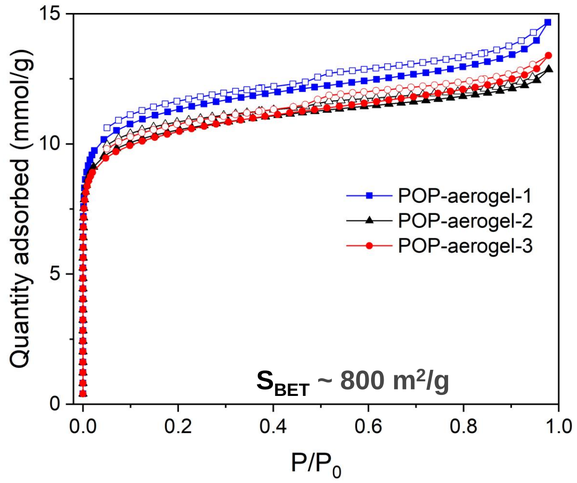
Synthesis and engineering of cost-effective porous organic polymers (POPs)

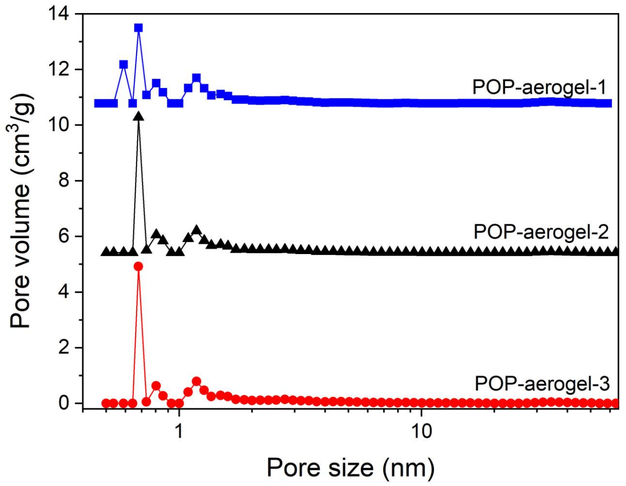




POP aerogel

- Facile and green synthesis
- Low cost (estimated cost: 10 USD/kg)
- Highly porous
- Mechanically strong
- Chemically stable





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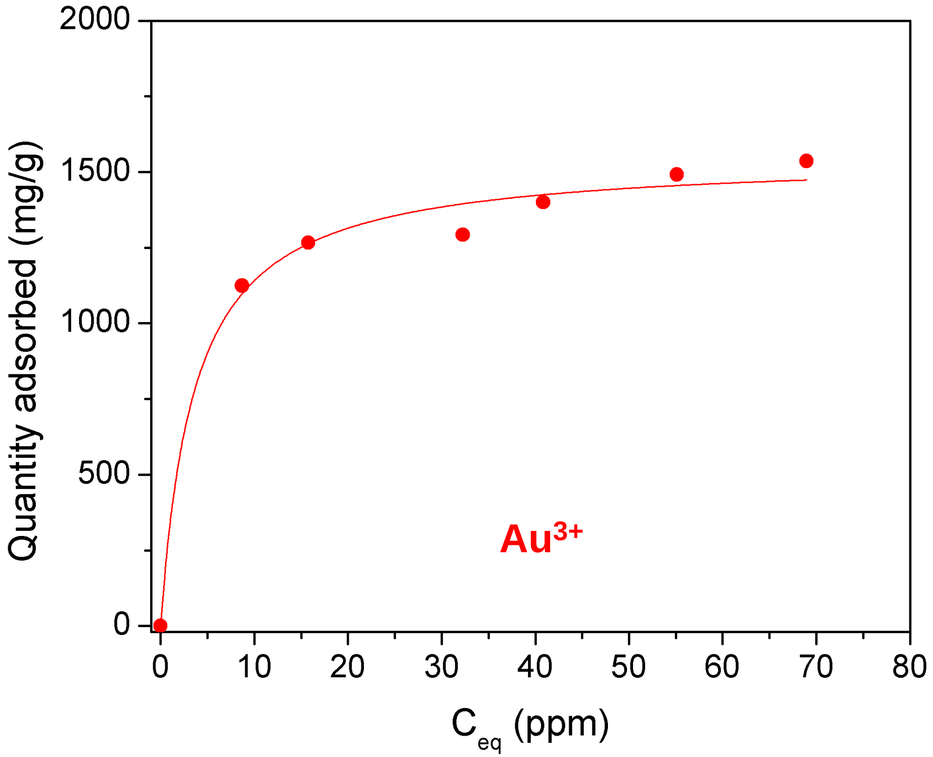
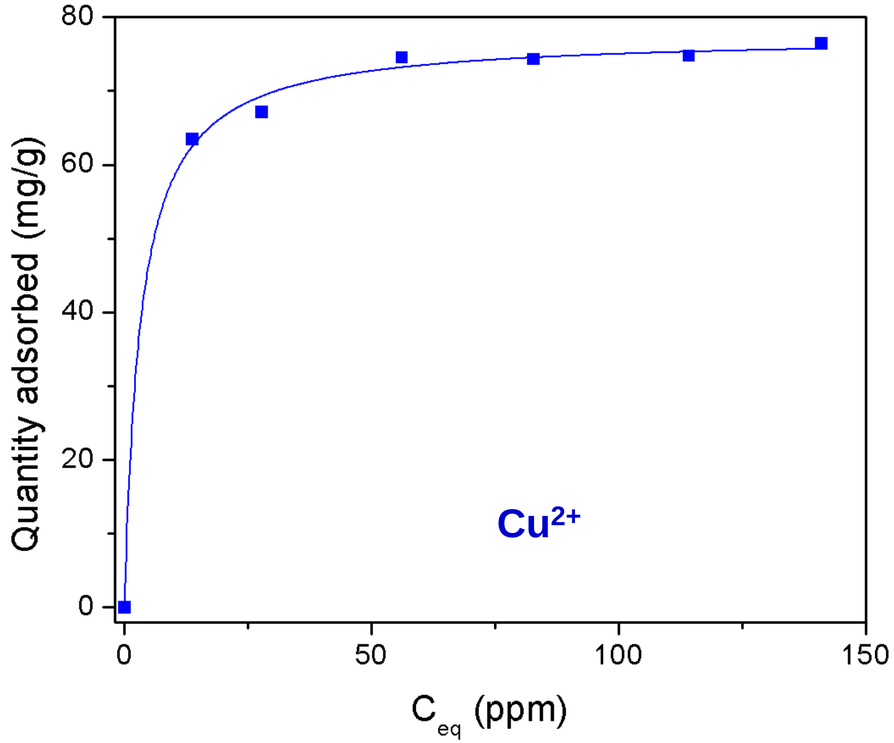
Results so far

POPs for Au capture from aqueous solutions





- **High Au uptake**
- **High selectivity**

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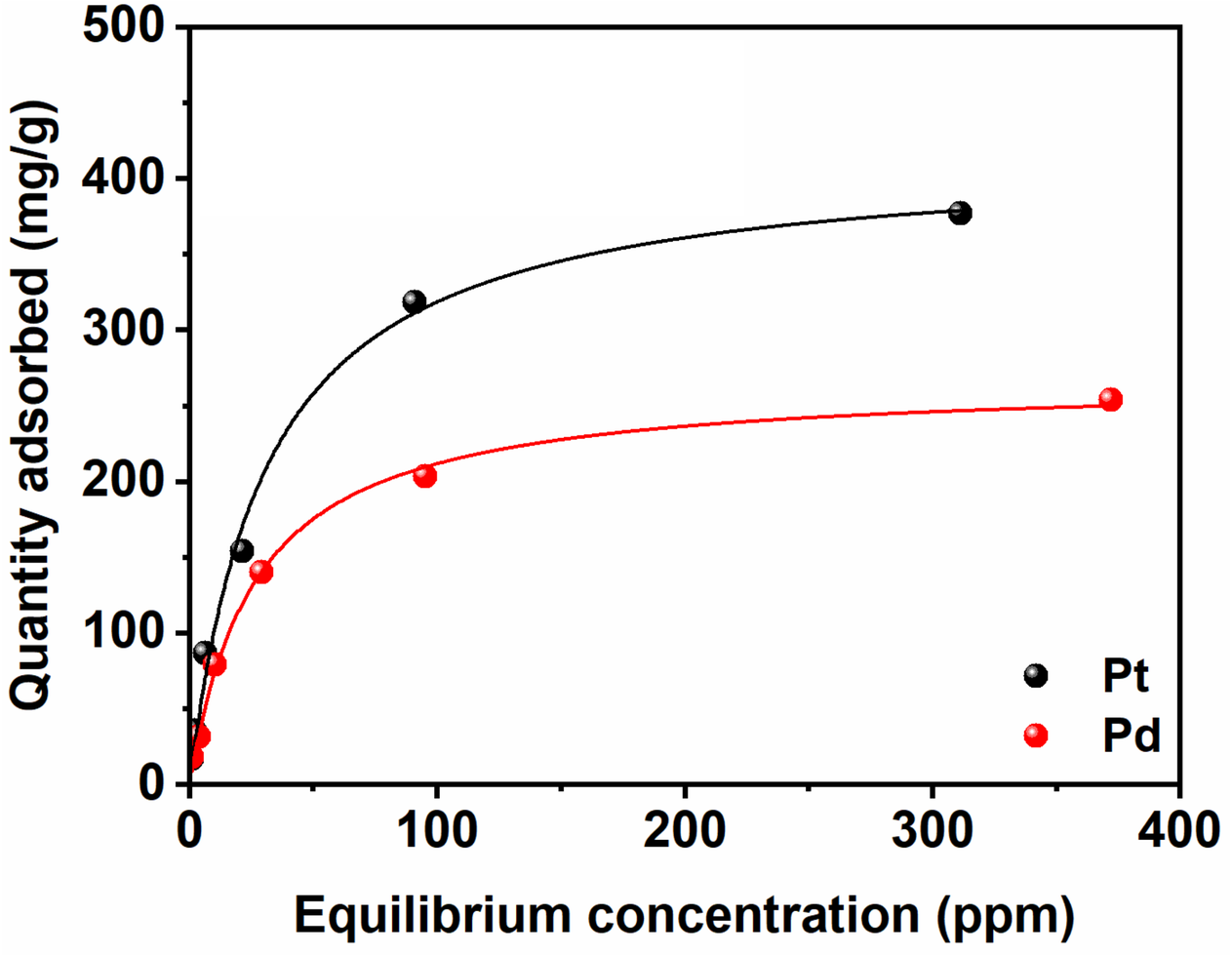
Results so far

POPs for Pd and Pt capture



Potential applications for recovering Pd and Pt from:

- **E-waste**
- **Waste solutions from pharmaceutical and chemical industries**
- **Spent automotive catalysts**

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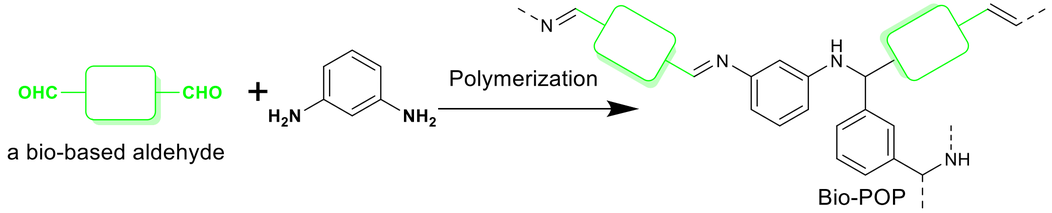
Results so far

Synthesis and processing of bio-based porous organic polymers

(a)



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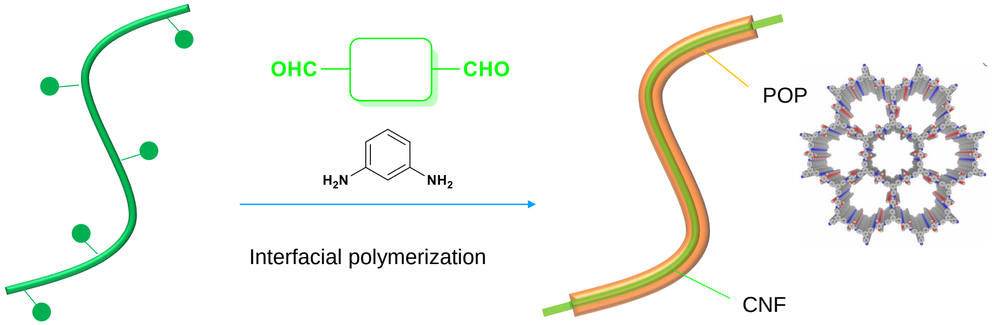
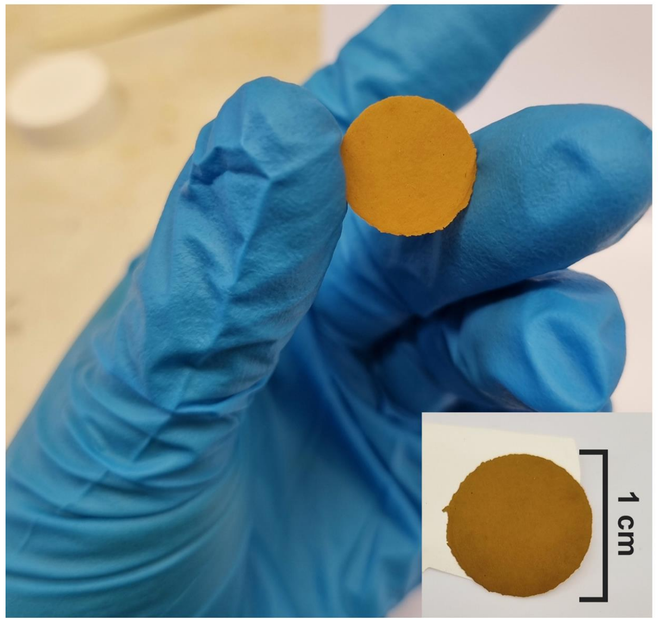


Cellulose nanofiber (CNF)

CNF@bio-POP

(c)



Freestanding CNF@bio-POP nanopaper

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Upcoming activities and next step

- Test bio-POP and freestanding CNF@bio-POP nanopaper for efficient precious metal capture
- Conduct breakthrough experiments to capture precious metals from mixed solutions
- Focus testing on capturing precious metals from E-waste leaching solutions
- Develop prototypes to advance practical applications of POP materials in E-waste recycling

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Mining innovation for a sustainable future

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