

SUPERMET Project: Recovery of Precious Metals from Spent Catalysts by Supercritical CO₂ Extraction Assisted by Polymers

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RESEARCH & INNOVATION PROGRAMME ON RAW MATERIALS TO FOSTER CIRCULAR ECONOMY



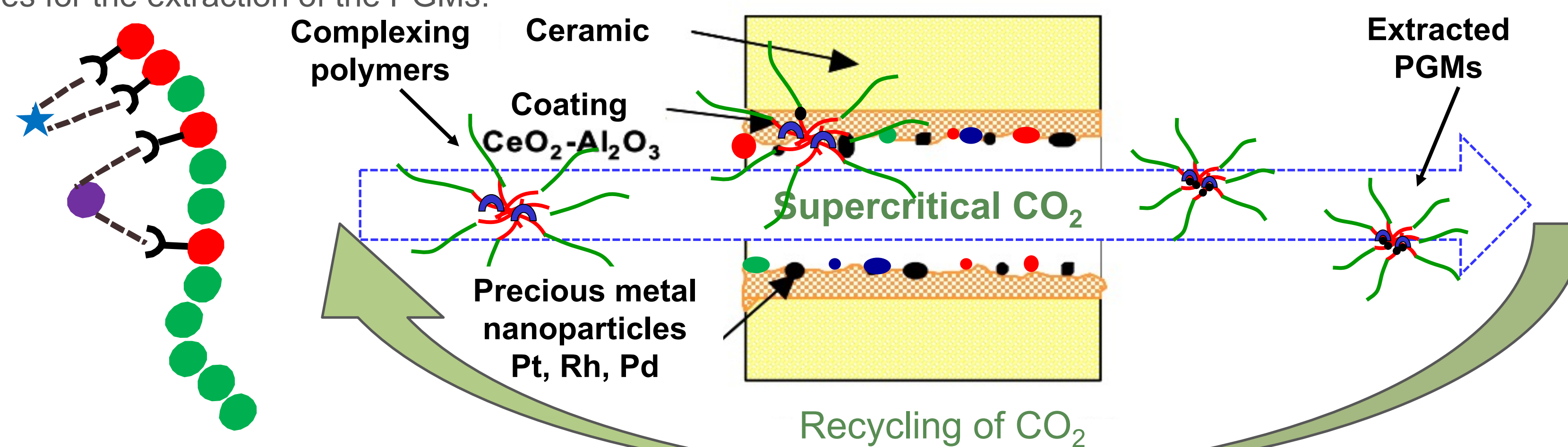
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SUPERMET
PROJECT

Context

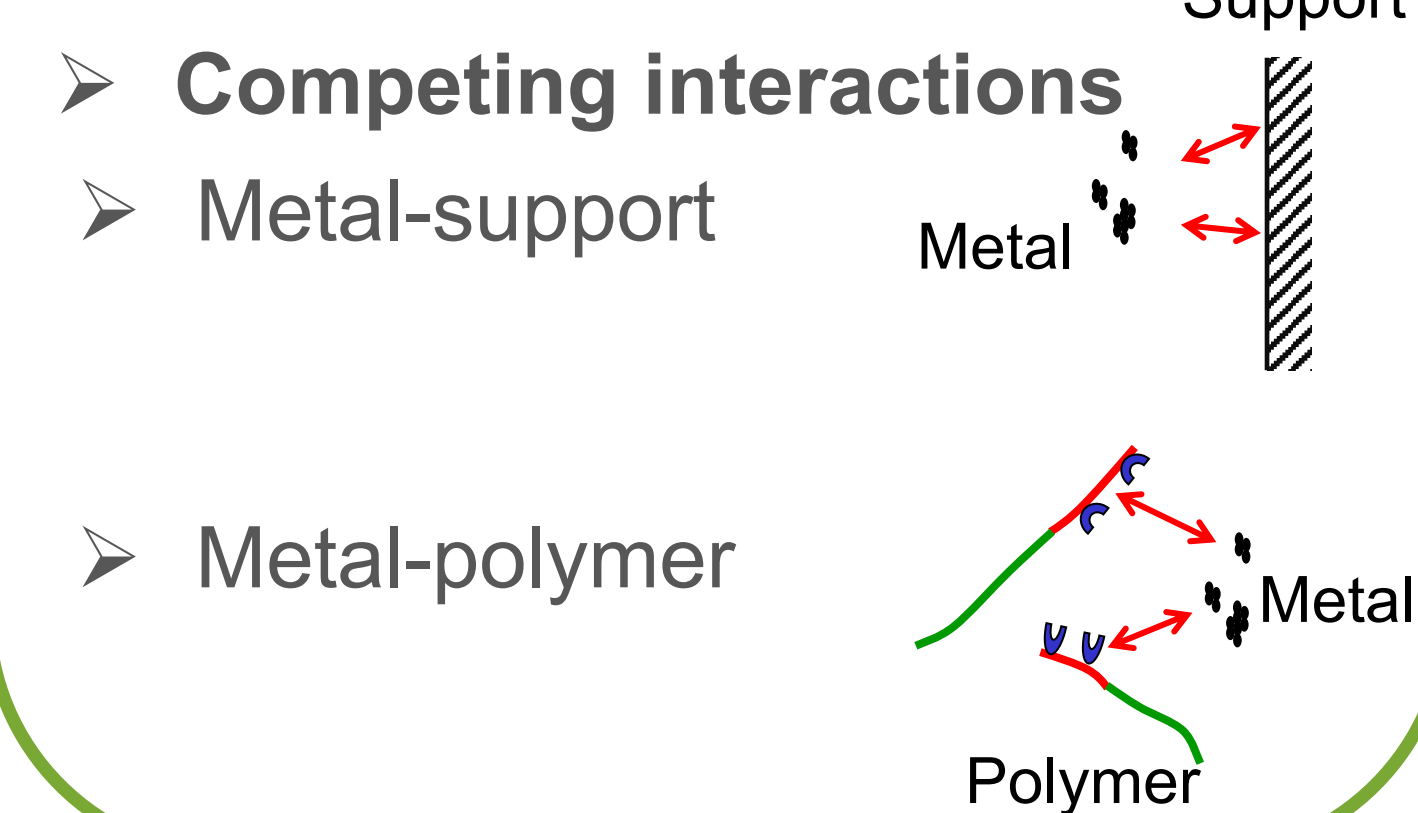
Pyrometallurgical or hydrometallurgical techniques to recover precious metals are energy intensive, destructive of the supports, and lead to the generation of a large amount of toxic effluents to be treated. We propose a greener alternative to recover platinum group metals (PGMs) using supercritical CO₂ (scCO₂), a non-toxic, inexpensive, and readily available solvent. Some polymers will be designed as additives for the extraction of the PGMs.

- scCO₂-philic monomer unit
- Metal complexing monomer unit
- Metallic nanoparticles
- ★ Molecular ionic metallic species
- Complexing group
- Ligand-metal interaction

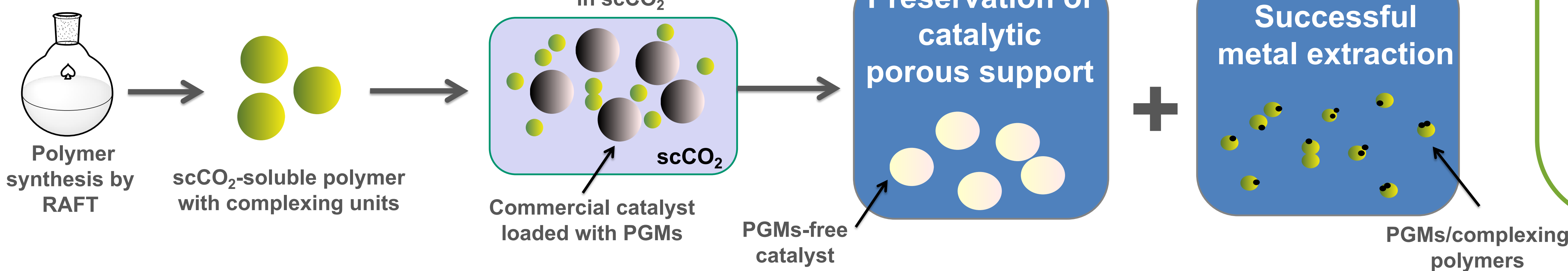


Challenges

- Polymer solubility in scCO₂
- Metal complexing ability of polymer
- Extraction of metal-polymer complex in scCO₂
- Separation and recovery of the metal from the polymer

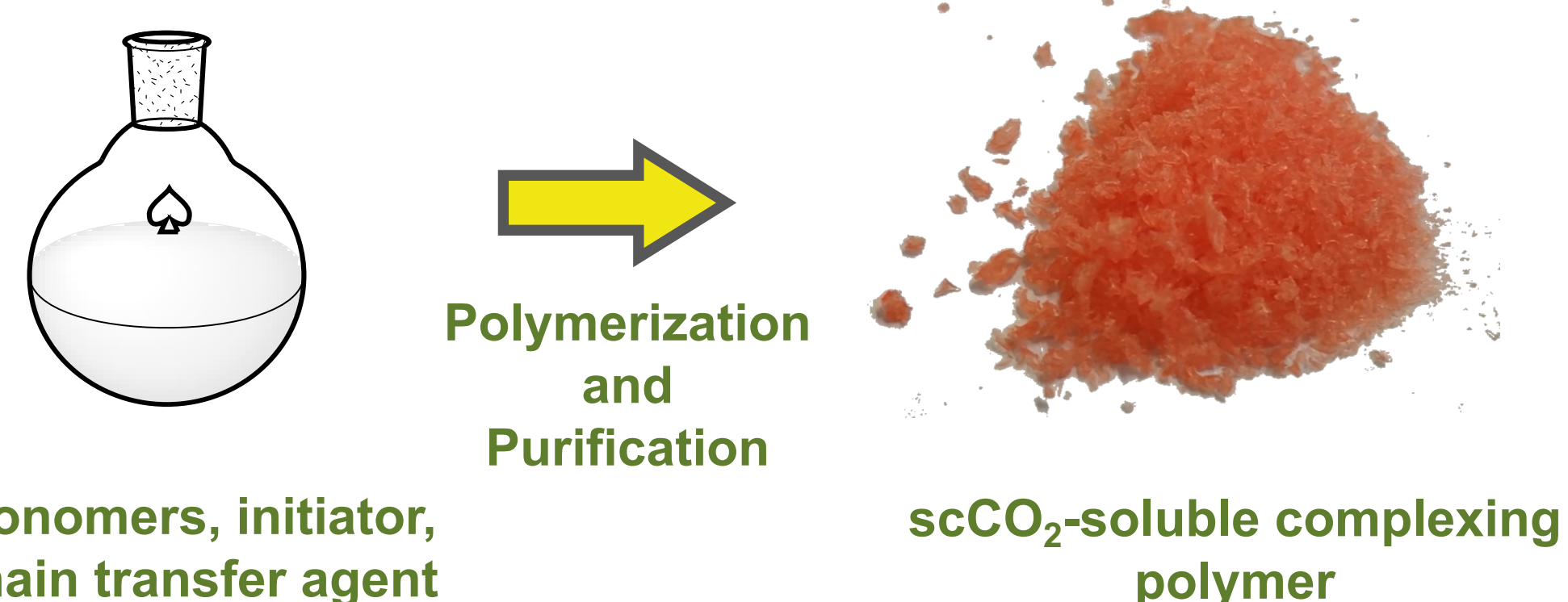


Strategy



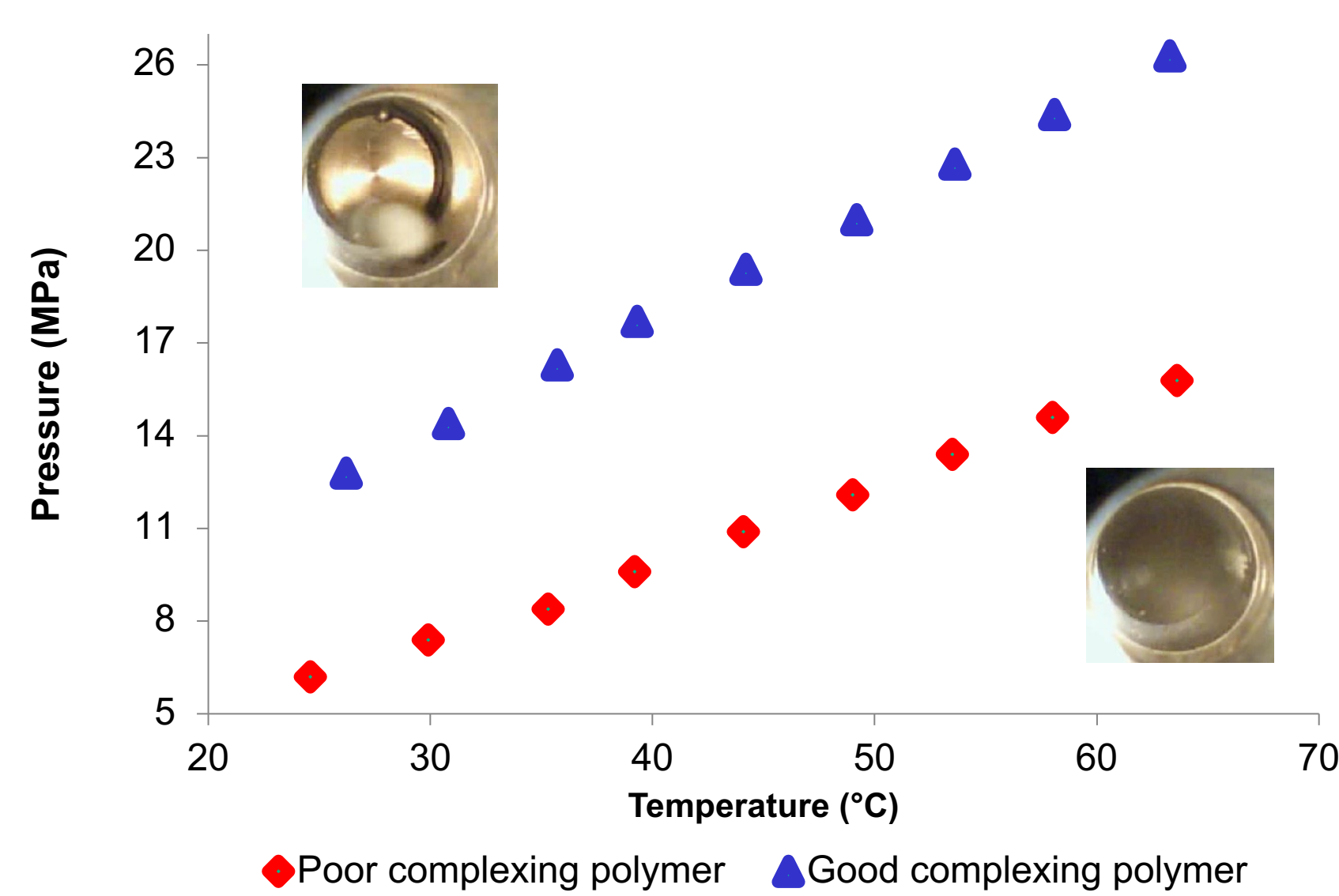
Polymer synthesis

Reversible addition-fragmentation chain-transfer (RAFT) Polymerization



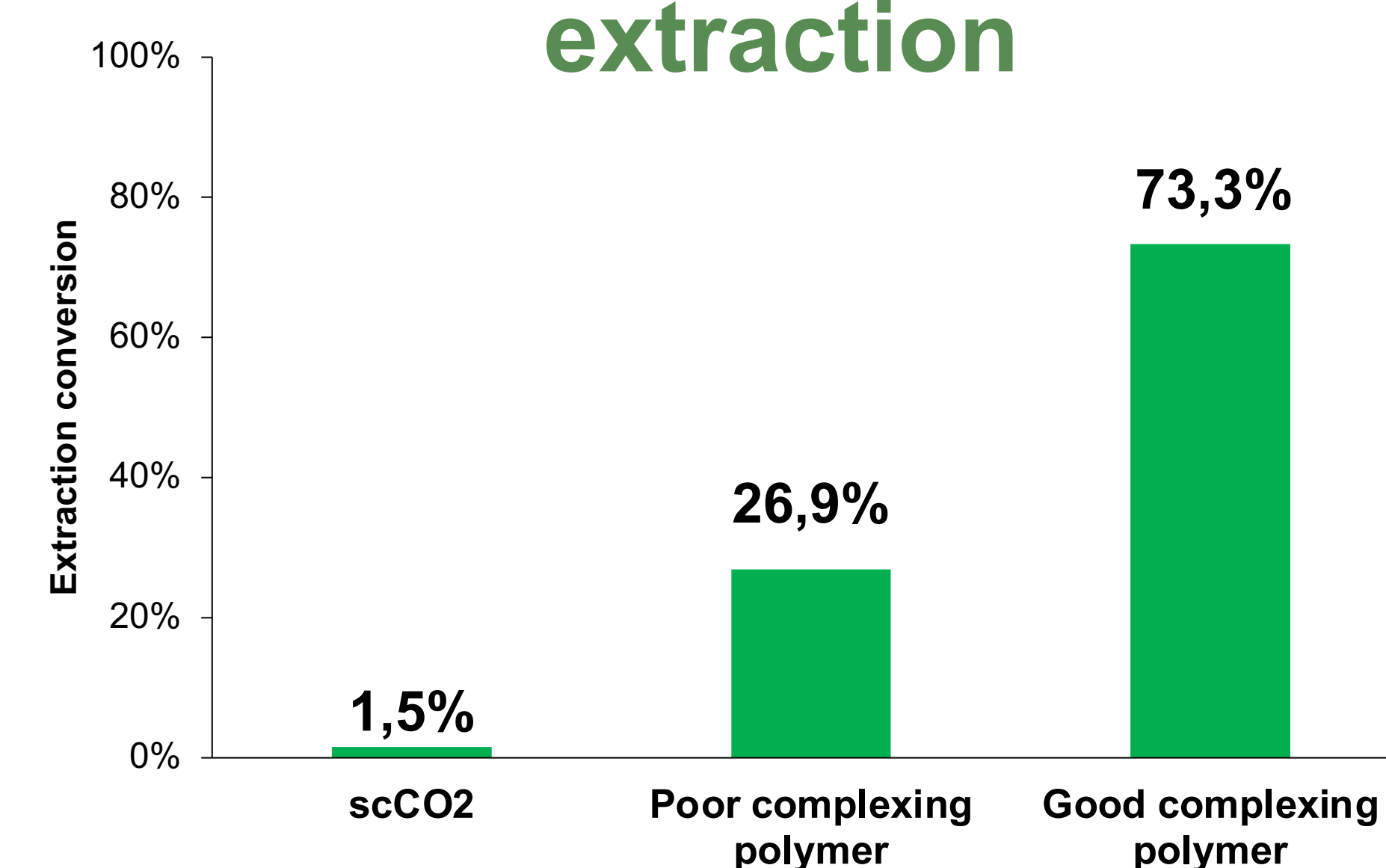
ICGM
Institut Charles Gerhardt Montpellier

Cloud point determination



Phase behavior of polymers in scCO₂ studied by ICGM

Neat CO₂ and polymer-assisted extraction

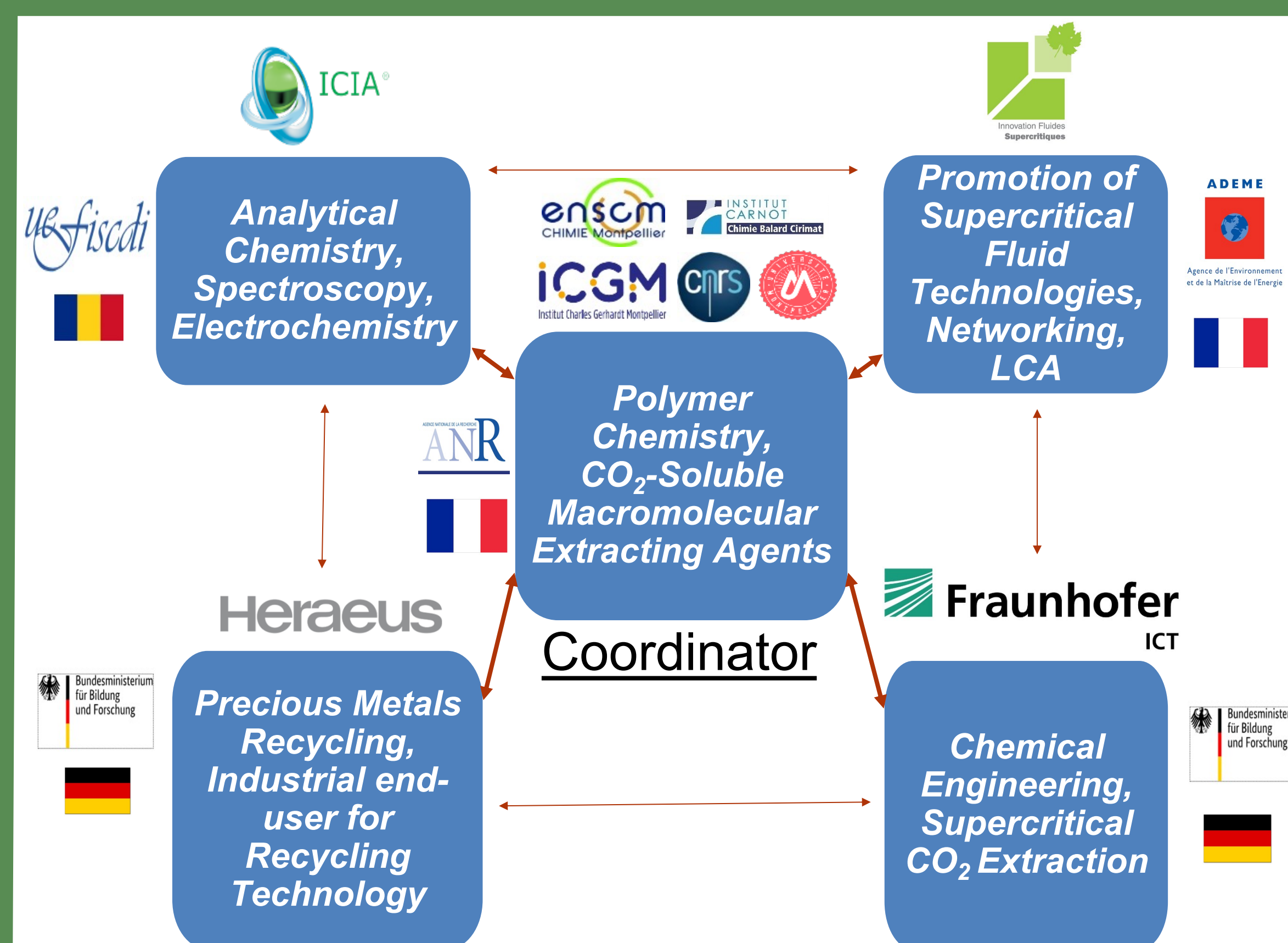


Precious metal extraction in scCO₂ studied by ICGM and ICT

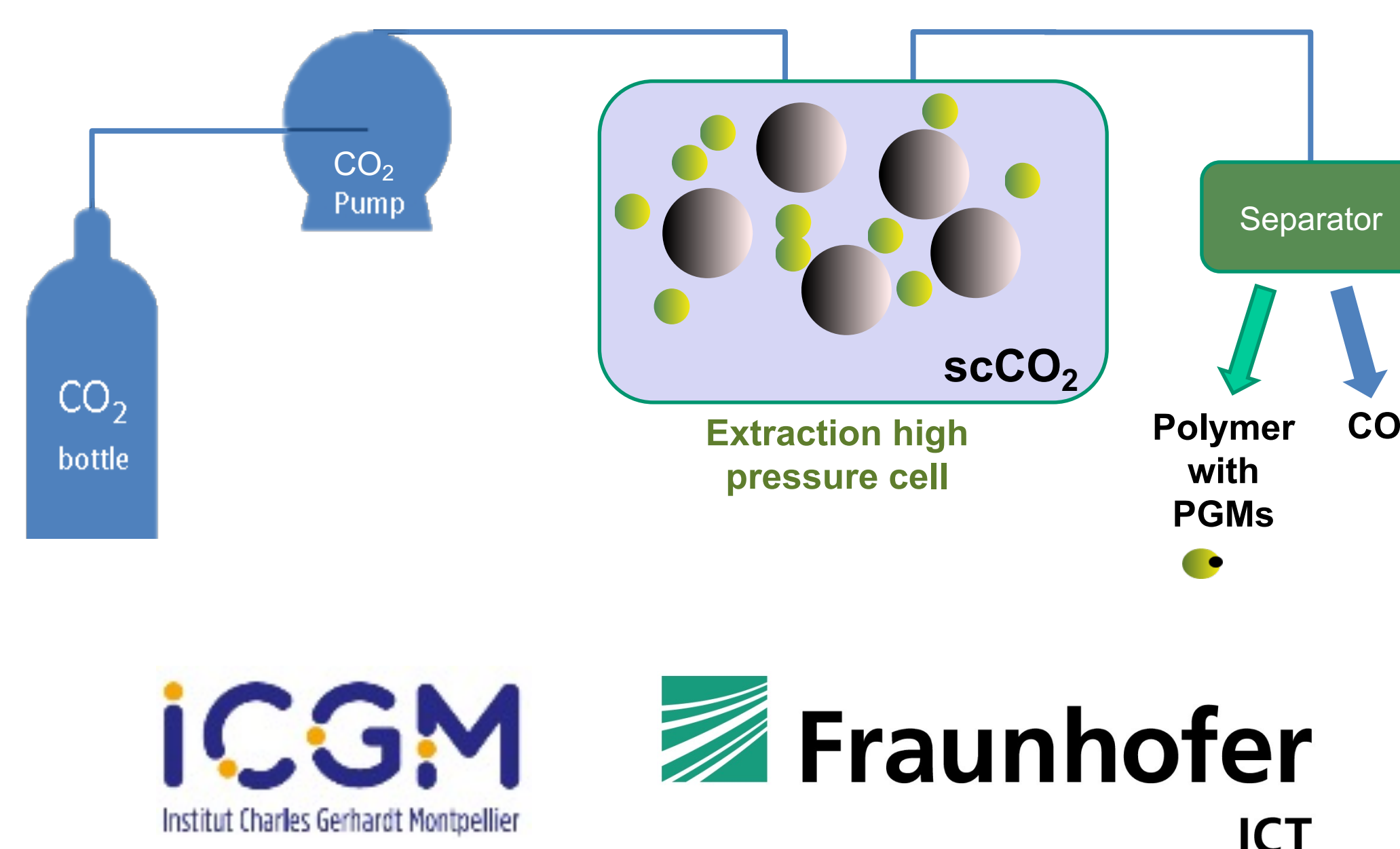
Commercial PGMs catalysts



Heraeus



Precious metal extraction with supercritical CO₂ assisted by CO₂-philic complexing polymers



ICGM
Institut Charles Gerhardt Montpellier

Fraunhofer
ICT

Analytical support

Mass Spectrometry, Spectroscopy, Electrochemistry

ICP-OES, ICP-MS

UV-visible spectrometer

Elemental analysis



Communication

Promotion of Supercritical Fluid Technologies

Networking

Life Cycle Analysis

website: <https://supermetproject.eu>



Acknowledgments

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References

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M. Senila et al. *Materials* **2020**, *13*(22), 5136

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